SUPREME COURT, U. S.

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# In the Supreme Court of the United States

OCTOBER TERM, 1975

No. 75-1244

WILBUR T. BOLKCOM and WILLIAM E. KNAPP,
*Petitioners,*

v.

THE CARBORUNDUM COMPANY,
*Respondent.*

## PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SIXTH CIRCUIT

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# In the
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October Term 1975

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No.

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WILBUR T. BOLKCOM and WILLIAM E. KNAPP,
*Petitioners,*

v.

THE CARBORUNDUM COMPANY,
*Respondent.*

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**Petition For A Writ Of Certiorari To The United States Court of Appeals For The Sixth Circuit**

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Petitioners, Wilbur T. Bolkcom and William E. Knapp, ask that a writ of certiorari issue to review the judgment of the United States Court of Appeals for the Sixth Circuit in this case entered on September 30, 1975.

## OPINIONS BELOW

The opinion of the court of appeals was entered September 30, 1975, on a hearing held October 5, *1973*. The opinion and judgment are reported at 523 F.2d 492 and appended hereto as Appendix A, pp. 1a-12a. The opinion of the district court was rendered orally at the end of the trial. The opinion and judgment of the district court are unreported and are appended thereto as Appendix B, pp. 14a-29a, 51a. The findings and conclusions of the district

court consistent with the opinion are also part of Appendix B, pp. 30a-50a.

## JURISDICTION

The judgment of the court of appeals was entered on September 30, 1975 (Appendix A, p. 12a). A timely petition for rehearing was denied on December 4, 1975 (Appendix A, p. 13a). The jurisdiction of this Court is invoked under 28 U.S.C. §1254 (1).

## QUESTIONS PRESENTED

1. Whether the statute governing reissue of patents, §251 of the 1952 Patent Act, can be interpreted to void claims of reissue patents enlarging or narrowing the scope of the claims of the original patent, contrary to the express terms of that statute, by engrafting thereon additional legal criteria created by repealed statute §64, R.S. §4916 (1928).

2. Whether the doctrine of equivalents last enounced in *Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co.*, 339 U.S. 605 (1950) can be abrogated by finding incidental differences between one element of a patented combination and a corresponding element of an accused combination where the accused combination is found virtually identical with the patented combination in every other respect and the particular element is found to perform substantially the same function to achieve the same result as the element of the patented combination.

## STATEMENT OF THE CASE

**Background:**

Petitioners, Bolkcom and Knapp, are the coinventors-patentees of United States Patent No. Re. 27,018 (hereinafter Patent '018), granted January 5, 1971, and United States Patent No. 3,423,605 (hereinafter Patent '605), granted

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March 11, 1969. Patent '018 is the patent in suit and a reissue of Patent '605. A copy of Patent '018 is appended hereto as Appendix C, pp. 52a-59a.

The invention claimed in the patents is a novel plant for the manufacture of silicon carbide. Silicon carbide was first made in 1891 by Edward Acheson, the founder of respondent Carborundum. It is made by fusing a mixture of silica sand ($Si0_2$) and carbon (C), such as coke or graphite, in a furnace heated by an electrical resistance core to an extremely high temperature (about 4,000° F) for about 30 hours.

From its discovery in 1891 until the advent of petitioners' invention in 1966, seventy-five years later, all silicon carbide manufactured in North America was made in fixed, immovable furnaces. These stationary furnaces were set in banks of four (4) to six (6), close to one another and to the electrical power source used for firing. The furnaces in a bank were typically operated in a cycle, with one furnace being loaded, one furnace being fired, at least one furnace cooling and one furnace being unloaded. The total cycle took about five to seven days for each furnace. Each stationary furnace requires approximately three days to cool after firing, before the workmen could unload it and load a new charge. Hand labor was used in loading and unloading the furnaces, and the cramped working conditions and high temperatures resulting from the close proximity of the furnaces to each other and to the electrical source made this activity extremely difficult and dangerous.

**The Invention:**

The patented invention is built on the concept of using mobile furnaces, mounted on wheels, that could be removed from the electric power source after firing, placed at a distance for cooling and stripping (without totally cooling as with the stationary furnaces), moved to another area of the

plant for reloading, and again moved to the electrical source for firing. The invention has the ability of selectively moving each furnace car through the entire cycle—firing, cooling, stripping and reloading— without interfering in any way with the operating cycle of any other mobile furnace.

The selectivity is achieved by a "transfer car" (or "transfer means") having a trackway on top, which may be aligned with any trackway in the furnace area, cooling/stripping area or loading area of the plant. The furnace car is selectively moved from one area to another by aligning the trackways on the transfer car with the trackways supporting the furnace car, moving the furnace car onto the transfer car, moving the transfer car with the furnace car on it into alignment with trackways of another area, and moving the furnace car off the transfer car onto the trackways of the other area.

The combination invention is described in a detailed summary in both the original and reissue patents as follows:

> "... an electrical power source, a main trackway adjacent said power source, a furnace bottom mounted on wheels on said trackway movable to and away from said power source; said furnace bottom having a substantially flat heat resistant surface, removable sides along each side of said surface and removable ends on said surface, said sides and ends defining a heating chamber, electrode means in each of said ends, removable connections between said electrode ends and said power source, a transfer car movable transversely to the main trackway and having a corresponding trackway adapted to be aligned with the main trackway to receive the furnace bottom wheels and furnace whereby said furnace may be moved transversely to said main trackway, a service area spaced from said main trackway by said transfer car, secondary trackways in said service area receiving said

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furnace from said transfer car, loading means at said service area adapted to load said furnace and a cooling and unloading section in said service area spaced from the loading means." [Appendix C, Col. 1, line 61 — Col. 2, line 9.]

Petitioners conceived their invention in 1964, and successfully reduced it to practice in April 1966 at their Springdale, Pennsylvania plant, where they began the commercial production of silicon carbide. After this plant began operations, Petitioners filed an application for Letters Patent that matured into Patent '605.

**The Reissue Patent:**

Reissue Patent '018 is identical to the original Patent '605 except for the addition of claims 11-14. Not one word, number or line of the description in the specification and drawings was changed. And claims 1-10 of Patent '018 are the same as the claims of Patent '605.

Claims 11-14 enlarged the scope of the claims from the original patent, but only in two substantive respects: First, the requirement that the "transfer car" be movable "on a trackway extending transversely to the main trackway" (claim 1) was removed to make the claim commensurate with the broader description in the specification, above quoted, *supra*, p. 4. Second, the "transfer *car*" was prescribed as a "transfer *means* between the first trackway and the second trackway selectively delivering a furnace car from one to the other" to enable the claims to cover the embodiments "described in the specification and equivalents thereof" in accordance with 35 U.S.C. §112.

The reissue of the patent was spawned when, shortly after the original patent was issued, petitioners learned of respondent's plan to build a mobile furnace plant for making silicon carbide at Jacksboro, Tennessee. Bolkcom and Knapp counseled with their patent counsel and were advised

that their patent was sufficient to cover the proposed plant, as they were advised it would be. The investigation concluded, however, that the patent claims were not adequate to cover the patented combination where the transfer means were ladder tracks, overhead cranes and turntables not supported on trackways; and the reissue resulted.

**The Accused Combination:**

Respondent's Jacksboro Plant went into operation in April 1971, shortly after its completion. This marked Carborundum's first departure from the stationary manufacturing plant proposed by Acheson in 1891, despite a continuing search by its skilled personnel for a more facile, economical and efficient way of making silicon carbide.

The Jacksboro Plant came about after respondent became fully advised of petitioners' invention. Bolkcom and Knapp sought to interest Carborundum in licensing or buying their invention. To that end, two of Carborundum's officials visited the Springdale Plant on May 12, 1967, and were given a copy of the original patent application, then pending.

July 5, 1968 is the date of the sketch layout of Carborundum's proposed mobile furnace plant at Jacksboro. It reveals that Carborundum proposed to use petitioner's combination verbatim with the transfer means that its representatives had seen at the Springdale Plant, namely, a transfer car movable linearly on supporting tracks extending transversely of the trackways for the mobile furnaces.

The plant combination actually built at Jacksboro was virtually identical in every respect to the Springdale Plant except that a turntable supported at its periphery on curved trackways extending transversely of the trackways for the mobile furnace was used instead of a transfer car movable

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linearly on supporting transverse tracks. The purported reason for the change was that "to utilize a surplus railroad turntable in place of the transfer car previously planned . . . could save us about $90,000."

**Decisions Below:**

The district court held that claims 1-10 of Patent '018 (identical to the claims of Patent '605) were valid, but were not literally infringed by the accused combination, even though that combination was virtually identical in all other respects except that it employed a turntable instead of a linear transfer car to achieve selectivity. The district court also found that a turntable was not equivalent to the linear transfer car arrangement. The district court did find that the accused combination with the turntable responded to the broader reissue claims 11-14 with the "transfer means," but found those claims were invalid under 35 U.S. C. §251 as an "unauthorized enlargement of the disclosure of the patent."

The court of appeals affirmed the decision of the district court finding claims 1-10 of Patent '018 valid, 523 F.2d at 498-501. The circuit court again found that the accused plant was "virtually identical with" the patented combination of claims 1-10 "in every other respect [except it] utilized a turntable instead of a transfer car to transport the mobile furnaces," 523 F.2d at 502, and found that "the turntable does perform substantially the same function as the transfer car" to achieve "the same result," 523 F.2d at 502,503. But the court declined to overturn the district court's finding of non-equivalence.

The court of appeals found that the accused combination with a "turntable apparently falls within the broader reissue claims coverage of a 'transfer means'," 523 F.2d at 498. And, on validity of claims 11-14, the circuit court found, 523 F.2d at 497:

> "Typical of the new claims added, 11-14, is claim 11, which is *identical* to claim number 1 *in substance except*

> that it provides for achieving the desired selectivity through the use of a 'transfer means' instead of a 'transfer car on a track transverse to the main trackway'." [Emphasis added.]

Yet, the court found claims 11-14 "were an unauthorized enlargment of the disclosure in the original patent" following *U. S. Industrial Chemicals, Inc. v. Carbide & Carbon Corp.*, 315 U.S. 668 (1942), and affirmed the finding of invalidity of them.

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## REASONS FOR GRANTING REVIEW

### I. THERE IS A CONFLICT AMONG THE COURTS OF APPEALS ON THE STATUTORY AUTHORITY OF THE COMMISSIONER OF PATENTS TO GRANT REISSUE PATENTS WITH CLAIMS ENLARGING OR NARROWING THE SCOPE OF THE CLAIMS OF THE ORIGINAL PATENTS.

This case presents issues of first impression for this Court of substantial general importance with respect to the interpretation of the reissue section of the 1952 Patent Act. This Court has never considered §251, U.S.C. Title 35, governing the reissue of patents. The question in this case is crucial to the validity of hundreds of reissue patents with claims enlarging or narrowing the scope of the original patents.

To date, five courts of appeals and the Court of Customs and Patent Appeals have adopted conflicting standards on the propriety of reissuing patents with broadened or limited claims under §251, U.S.C. Title 35. The Seventh Circuit and the Court of Customs and Patent Appeals have followed the express language of §251 and

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validated reissue patents "for the invention disclosed in the original patent . . . enlarging [and narrowing] the scope of the claims," provided "no new matter" was introduced in the application for reissue. The Fourth Circuit, Ninth Circuit, Tenth Circuit and now the Sixth Circuit[1] have adopted more restrictive standards on reissue of patents. The latter decisions purport to follow *U. S. Industrial Chemical, Inc. v. Carbide & Carbon Chemicals Corp.*, 315 U. S. 668 (1942), construing repealed statute §64, R.S. §4916, May 24, 1928, which requires that the reissue patents be "for the same invention" as the original patent. The conflict involves important issues which have not, but should be decided by this Court.

Section 251 of the 1952 Patent Act provides for "Reissue of Defective Patents" as follows:

> "Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, *or by reason of the patentee claiming more or less than he had a right to claim in the patent*, the Commissioner shall, on the surrender of such patent and the payment of the fee required by law, *reissue the patent for the invention disclosed in the original patent*, and in accordance with a new and amended application, for the unexpired part of the term of the original patent. *No new matter* shall be introduced into the application for reissue.
>
> The Commissioner may issue several reissued patents for distinct and separate parts of the thing patented, upon demand of the applicant, and upon payment of the required fee for a reissue for each of such reissued patents.

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1 The Sixth Circuit appeared to construe §251 in accordance with its express language, *Hartzell Industries, Inc. v. McCauley Industrial Corp.*, 304 F.2d 481 (1962), but adopted a different, restrictive interpretation in this case without reference to its earlier decision.

> *The provisions of this title relating to applications for patents shall be applicable to applications for reissue of a patent*, except that application for reissue may be made and sworn to by the assignee of the entire interest if the application does not seek to enlarge the scope of the claims of the original patent.
>
> No reissued patent shall be granted *enlarging the scope of the claims of the original patent unless applied for within two years from the grant of the original patent*. July 19, 1952, c. 950, §1, 66 Stat. 808." [Emphasis added.]

This statute provides that reissue patents can enlarge (within two years) or narrow the scope of the claims of the original patent where the patentee claimed "more or less than he had a right to claim" in the original patent.

Prior to the enactment of 35 U.S.C. §251, a patentee was entitled to a reissue patent under the provisions of §64,[2] R.S.

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2 "Whenever any patent is wholly or partly inoperative or invalid, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery *more* than he had a right to claim as new, if the error has arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, the commissioner shall, on the surrender of such patent and the payment of the duty required by law, cause *a patent for the same invention*, and in accordance with the corrected specification, to be reissued to the patentee or to his assigns or legal representatives, for the unexpired part of the term of the original patent. Such surrender shall take effect upon the issue of the reissued patent, but in so far as the claims of the original and reissued patents are identical, such surrender shall not affect any action then pending nor abate any cause of action then existing, and the reissued patent to the extent that its claims are identical with the original patent shall constitute a continuation thereof and have effect continuously from the date of the original patent. The commissioner may, in his discretion, cause several patents to be issued for distinct and separate parts of the thing patented, upon demand of the applicant, and upon payment of the required fee for a reissue for each of such reissued letters patent. The specifications and claims in every such case shall be subject to revision and restriction in the same manner as original applications are. Every patent so reissued, together with the corrected specifications, shall have the same

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§4916, May 24, 1928 c. 730, 45 Stat. 732. That section did not by its terms provide that a patentee could enlarge the scope of the claims by obtaining a reissue patent. Rather, §64 provided that the Commissioner of Patents "shall . . . cause a patent *for the same invention*, and in accordance with the corrected specification, to be issued to the patentee . . . ".

The "same invention" requirement was last interpreted by this Court in *U. S. Industrial Chemicals, Inc. v. Carbide & Carbon Chemicals Corp.*, 315 U.S. 668, 675-76 (1942). There, the Court held, *inter alia*, that:

> "[I]t is not enough that an invention might have been claimed in the original patent because it was suggested or indicated in the specification. It must appear from the face of the instrument that what is covered by the reissue was intended to have been covered and secured by the original."

While this holding was consonant with earlier decisions under prior Patent Acts containing the "same invention" requirement which limited reissue patents enlarging and narrowing claims to strict standards, see, e.g., *Parker and Whipple Co. v. Yale Lock Co.*, 123 U.S. 87 (1887), the decision does not present the standards controlling the reissue of patents under the Patent Act of 1952.

Section 64 of the Revised Statutes was repealed by the Act of July 1952, c. 950, §1.66 Stat. 792, which enacted into law a new reissue statute, §251. Section 251 made three (3)

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effect and operation in law, on the trial of all actions for causes thereafter arising, as if the same had been originally filed in such corrected form; *but no new matter shall be introduced into the specification*, nor in case of a machine patent shall the model or drawings be amended, except each by the other; but when there is neither model nor drawing, amendments may be made upon proof satisfactory to the commissioner that such new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake, as aforesaid." [Emphasis added.]

important changes from the prior statutory law with its judicial interpretation:

> 1. It specifically provided that a reissue patent can be granted enlarging the scope of the claims of the original patent if the reissue patent is applied for within two years of grant of the original patent;
>
> 2. It provided when the patentee claimed "more or less than he had a right to claim in the [original] patent, the Commission shall . . . reissue the patent for the invention disclosed in the original patent" with "the provisions of this title relating to applications for patent . . . applicable to applications for reissue . . . "; and
>
> 3. It eliminated the requirement that the claims of the reissue be "for the same invention" as the original patent.

Notwithstanding the change of law effected by §251, certain circuits have continued to restrict reissue patents by engrafting on the express terms of the statute the legal criteria of repealed statute §64 as judicially interpreted. The Sixth Circuit forcefully states the position of these courts of appeals in the present case. Citing and quoting *U.S. Industrial Chemicals Co. v. Carbide & Carbon Chemicals Corp.*, *supra*, and *Parker and Whipple Co. v. Yale Lock Co.*, *supra*, the Court found, 523 F.2d at 502:

> "The Supreme Court has made it clear that *this section* [§251] is intended only to permit the reissue of a new patent for *the same invention* as that disclosed in the original patent in order to permit the correction of an innocent inadvertent defect or omission. *It is not intended to permit the patentee to broaden the claims of the original patent.*" [Emphasis added in part]

Applying this enouncement, the court found that the new claims (i.e., claims 11-14) added by reissue were not limited

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in scope to the explicit disclosure of the original patent and "were an unauthorized enlargement of the disclosure in the original patent" 523 F.2d at 502.

The Fourth, Ninth and Tenth Circuits have enounced similar standards governing the reissue of patents. These courts of appeals too do not consider the statutory changes brought by §251. Following *U.S. Industrial Chemicals* and other decisions under repealed section 64, these courts require that a reissue patent, unlike an original patent, must be limited to the same invention "explicitly disclosed and taught" in the original application for patent:

> "It must appear upon the face of the original patent that the matter covered by the reissue was intended to have been covered and secured by the original .... *The broader claims of the reissue must be more than merely suggested or indicated in the original patent.* U.S. Industrial Chemicals, Inc., v. Carbide & Carbon Chemicals Corp., 315 U.S. 668, 675-676, 62 S.Ct. 839, 844, 86 L.Ed. 1105. As observed in that case, "it is not enough that an invention might have been claimed in the original patent because it was suggested or indicated in the specification." *Riley v. Broadway-Hale Stores Inc.*, 217 F.2d 530, 532. (9 Cir., 1954) [Emphasis added.]

*Accord*, *McCullough Tool Co. v. Well Surveys, Inc.* 343 F.2d 381, 389 (10 Cir., 1965) *cert. den.* 383 U.S. 933; *Lockwood v. Langendorf United Bakeries, Inc.*, 324 F.2d 82, 94 (9 Cir., 1963); and *Sears, Roebuck & Co. v. Minnesota Mining & Mfg. Co.* 243 F.2d 136, 140 (4 Cir., 1957) *cert. den.* 355 U.S. 932.

On the other hand, the Seventh Circuit has taken the view that §251 "is remedial in intent and should be read liberally", *Hickory Springs Mfg. Co. v. Fredman Brothers Furniture Co. Inc. et al*, 509 F.2d 55, 61 (1975). That court of appeals has found that the reissue privilege has been broadened by §251 with the limitation remaining that no

"new matter" shall be added by way of reissue. Literally applying the statutory provision, the Seventh Circuit has consistently held:

> "[W]e are of the opinion that an *applicant for reissue may fully describe his original invention and include in his new description and claims* not only what was described before, but also what was suggested or implied in the original drawings, specifications and models. Inasmuch as the justified finding of the court was that *the reissue patent included only the inherent function and mode of operation of the original patent*, it follows that *no new matter* was introduced." *Weller Mfg. Co. v. Wen Products, Inc.* 231 F.2d 795, 800 (7 Cir., 1956) [Emphasis added.]

*Accord, Hazeltine Research Inc. v. Avco Mfg. Corp.* 227 F.2d 137, 143-44 (7 Cir., 1955) *cert den.* 350 U.S. 987; *Scovill Mfg. Co. v. Goldblatt Brothers, Inc. et al*, 362 F.2d 777, 779-80 (7 Cir., 1966) *cert den.* 385 F.2d 970; *Maxant Button & Supply Co. v. Sears, Roebuck & Co.*, 388 F.2d 912, 916-17 (7 Cir., 1968); and *Kearney & Trecker Corp. v. Tiddings & Lewis, Inc.* 452 F.2d 579, 593 (7 Cir., 1971) *cert den.* 405 U.S. 1066. See also, *Union Asbestos & Rubber Co. v. Paltier Corp.* 298 F.2d 48, 51-54 (7 Cir., 1962) *cert. den.* 369 U.S. 865; and *Crane Packing Co. v. Spitfire Tool & Machine Co.* 276 F.2d 271, 274 (7 Cir., 1960) *cert. den.* 363 U.S. 820.

Similarly, the Court of Customs and Patent Appeals (CCPA) has expressly rejected a restrictive interpretation of §251. Citing *U. S. Industrial Chemicals, Inc. v. Carbide & Carbon Chemicals Corp., supra,* and *Parker and Whipple Co. v. Yale Lock Co., supra,* the CCPA observed that "these cases were prior to the enactment of the Patent Act of 1952, which changes the words of the prior law, 'for the same invention', to the words above-quoted ['for the invention disclosed in the original patent']", and went on to hold:

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> "[I]f the board's view were to prevail, the reissue statute would be of very little practical effect, for, by elementary principles of claim interpretation, whenever an element or other limitation is added to or taken from a claim it becomes a claim to a different invention. *Yet the whole purpose of the statute, so far as claims are concerned, is to permit limitations to be added to claims that are too broad or to be taken from claims that are too narrow*. That is what the statute means in referring to 'claiming more or less than he had a right to claim' ". *Application of Handel*, 312 F.2d 943, 948 (CCPA, 1963). [Emphasis added.]

*Accord*, *Application of Wesseler*, 367 F.2d 838, 847-48 (CCPA, 1966).

The Seventh Circuit and CCPA have, therefore, construed §251 to mean that it *is* enough that the invention might have been claimed in the original patent. Those courts have found that the patentee has the right to reissue a patent to cover the invention disclosed in the original application as fully as he could have in the original application in accordance with "the provisions of this title relating to applications for patent". Moreover, those courts hold that the patentee is entitled to utilize the remedial provisions of §251 to claim his invention in a reissue of his patent by omitting or adding limitations in the claims provided he can show that claiming "more or less than he had a right to claim" in the original patent was "through error" and added "no new matter".

The present case clearly presents the conflicting positions of the lower courts for decision. Here, the specification, drawings and claims 1-10 of the original and reissue patents are identical. No "new matter" was added. The objection is that the new reissue claims eliminated the requirement that the "transfer car" be movable "on a trackway extending transversely to the main trackway," and

substituted for the "transfer car," a "transfer means . . . selectively delivering a furnace car from one [trackway] to the other [trackway]" in the enlarged claims (claim 11). The former change made the claims of the patent commensurate with the description of the invention in the specification, quoted *supra*, p. 4 (Appendix C, Col. 1, line 61 - Col. 2, line 9); and the latter change enlarged the claim consonant with 35 U.S.C. §112 which ordains that "a *means* . . . for performing a specified function . . . shall be construed to cover the corresponding structure, material or acts described in the specification and equivalents thereof."

Accordingly, the reissue patent in this case enlarged the scope of the claims to cover the "invention disclosed" that could have properly been claimed in the original patent. The claims are valid by the standards applied by the Seventh Circuit and the CCPA. Yet these claims were held invalid as "an unauthorized enlargement of the disclosure" by engrafting the restrictive legal criteria of repealed §64. The conflict clearly involves a substantial question of general impact which has not, but should be resolved by this Court.

## II. IT IS TIME TO RENEW AND VITALIZE THE DOCTRINE OF EQUIVALENTS WITH ITS IMPORTANCE TO THE APPLICATION OF THE PATENT LAWS. THE COURT OF APPEALS DECISION ABROGATES THE DOCTRINE OF EQUIVALENTS ESTABLISHED BY THIS COURT TO GUARANTEE TO PATENTEES THE STATUTORY RIGHT OF EXCLUSIVITY.

This case also presents issues of substantial nationwide importance with respect to the viability of the doctrine of equivalents. The doctrine of equivalents was last enounced twenty-five (25) years ago in *Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co.*, 339 U.S. 605 (1950). Since then,

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the courts of appeals have taken diverse positions in applying the doctrine particularly since this Court's decision in *Tigrett Industries v. Standard Industries*, 397 U.S. 586 (1970), *reh. den.* 398 U.S. 944[3]. The present case is a classic for denominating equivalence, providing an extraordinary opportunity for the Court to rejuvenate and develop the methodology of the doctrine of equivalents: The facts of the case are relatively simple; the lower courts made all the factual findings necessary for a finding of equivalents adjudged by the criteria of *Graver Tank*; and yet, the lower court failed to find equivalence based on an incidental difference between one element of the accused combination and a corresponding element of the patented combination.

The doctrine of equivalents is a principle of equity that originated over 120 years ago in *Winans v. Denmead*, 56 U.S. 545 (15 How. 330) (1853). The doctrine provides that even though the accused device or practice does not literally meet the claims of the patent, it nonetheless infringes "if it performs substantially the same function in substantially the same way to obtain the same result." *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 42 (1929). The reasons for the doctrine were forcefully stated by the Court in *Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co., supra* at 607:

> "[C]ourts have . . . recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing. *Such a limitation would leave room for — indeed encourage — the unscrupulous copyist to make unimportant and insubstantial changes and substitutions in the patent*

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3 *Tigrett Industries* cast doubt on this Court's continued acceptance of the doctrine of equivalents because of the amicus brief of the Department of Justice which frontally attacked the doctrine. The decision was affirmed by a 4-to-4 per curiam opinion, with two silent dissenters as well. See Dunner, Gambell and Kayton, *Patent Law Perspectives*, Annual Reviews, B.1 [1][b].

> *which, though adding nothing, would be enough to take the copies matter outside the claim, and hence outside the reach of law.* One who seeks to pirate an invention, like one who seeks to pirate a copyrighted book or play, may be expected to introduce minor variations to conceal and shelter the piracy. Outright and forthright duplication is a dull and very rare type of infringement. To prohibit no other would place the inventor at the mercy of verbalism and would be subordinating substance to form. It would deprive him of the benefit of his invention and would foster concealment rather than disclosure of inventions, which is one of the primary purposes of the patent system."
>
> [Emphasis added.]

Consonant with these equities, the doctrine of equivalents was "consistently applied by this Court and the lower federal courts . . . " for almost a hundred years, operating in favor of "the patentee of a secondary invention consisting of a combination of old ingredients which produce new and useful results" as well as the patentee of a pioneer invention, *supra* at 608.

*Graver Tank* states the methodology to be applied in adjudicating equivalents particularly in combination patents as follows, *supra* at 609:

> "Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. *It does not require complete identity for every purpose and in every respect.* In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, *things for most purposes different may sometimes be equivalents. Consideration must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would*

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> *have known of the interchangeability of an ingredient not contained in the patent with one that was.*" [Emphasis added.]

The methodology, therefore, is to address substance instead of form, and consider the element of the combination asserted to be an equivalent for the function which it performs and the qualities it imparts "when combined with" the other elements of the combination, and for its known "interchangeability" for the corresponding element of the patented combination.

Adjudicated by the *Graver* methodology, equivalence of the accused combination and the patented combination is clearly established. Both lower courts found that the accused plant was "virtually identical . . . in every other respect" with the claimed combination of the original claims 1-10, except the accused plant "utilized a turntable instead of a transfer car to transport the mobile furnaces," 523 F.2d at 502. And the lower courts found that "the turntable does perform substantially the same function as the transfer car," 523 F.2d at 503, and "achieved the same result" in the patented combination, 523 F.2d at 502. Hence, the function the turntable performs and the qualities it imparts "when combined with" the other elements of the patented combination are established.

Moreover, the "important element" that "persons resonably skilled in the art would have known of the interchangeability," *Graver*, *supra* at 609, is present. The court of appeals otherwise found in determining validity that the Van Wagenen Patent No. 492,069 "shows a turntable having wheels located at its periphery which ride on a track as the turntable rotates;" and that the German Patent No. 854,207 shows "the groups of furnaces move . . . back down the tracks to a turntable where they are positioned to move onto tracks leading to the servicing area," 523 F.2d at 499. The turntable was, therefore, there ready in the pertinent art

to be substituted once the patented combination became known to respondent on inspection of petitioners' Springdale plant. It was certainly an imperceptible step to make the furnace car trackway radial rather than parallel and the transverse trackway curved in a circle rather than straight to provide for interchangeability once the patented combination was made known. By the methodology of *Graver*, equivalence and infringement are, therefore, established in substance by the lower courts' findings.

The court of appeals did not apply the *Graver* methodology in adjudicating infringement. Although purporting to follow *Graver*, the court overlooked two of *Graver's* most salient admonitions: (i) "It does not require complete identity for every purpose and in every respect", and (ii) "In determining equivalents, . . . things for [some or] most purposes different may sometimes be equivalents." Certainly, whether the transfer means selectively moves a mobile furnace from area to area by rotational motion instead of translational motion, along curved transverse tracks instead of straight tracks, or by pivoting about a central pivot instead of with another suitable drive means is of no consequence to the fundamental interrelation and operation of the patented combination[4]. It may diminish performance and quality of the patented combination because, as the lower court observed, "the turntable may be limited by the number of tracks" and "only one furnace at a time can be transferred by the turntable," 523 F.2d at 502. But it is well-settled, equivalence cannot be avoided because the accused method is less efficient and imperfectly practices the patented combination, e.g., *Ziegler v. Phillips Petroleum Co.*, 483 F.2d 858, 868, 871 (5 Cir., 1973) *cert. den.*

4 The court's statement that "the turntable itself is stationary and transfers the furnances by pivoting around a central point," 523 F.2d at 503, is internally inconsistent and inconsistent with its previous finding on validity that "the turntable rotates," 523 F.2d at 499.

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414 U.S. 1079; and *McCollough Tool Co. v. Well Surveys, supra* 343 F.2d at 402.

The court of appeals' decision is also in direct conflict with the application of the doctrine of equivalents in *Tektronix, Inc. v. United States*, 445 F.2d 323 (Ct. Cl., 1970)[5]. In *Tektronix*, one of the patents was directed to an oscilloscope sweep generator circuit for establishing precise timing for the horizontal sweep. It claimed a sweep generator which included, among other things, "a pair of series connected diodes." The two infringing devices met the details and particulars of the claims fully except that substituted for the diodes in one was a pair of triodes and in the other a pair of pentodes. Although the triodes and pentodes provided some incidental benefits in the circuit, it was clear that the triodes and pentodes were used expressly and primarily for their diode function.

The Court recognized that, "Often, diodes, triodes and pentodes are not interchangeable, and thus are not equivalents, because of the different operating characteristics inherent in their construction," 445 F.2d at 329. In an earlier Court of Claims case, *Marconi Wireless Telegraph Co. v. United States*, 81 Ct. Cl. 671 (Ct. Cl., 1935), *aff'd in part and rev'd in part*, 320 U.S. 1 (1943), the court had expressly held that diodes and triodes were *not* equivalents for that invention. In that case, signal amplification, which is not possible in a diode, was a significant and material function for weak radio signals and therefore the amplifying triodes were held "not equivalent in the circuit in question." 445 F.2d at 329. In *Tektronix*, however, the court of claims cogently pointed out that it was the diode function of the triodes and pentodes that was the very reason for the use of the pentodes and triodes, "the other differences in their operating features

5 *Tektronix* is said to be in "facts and law denominating a classic equivalence situation," Dunner, Gambell and Kayton, *Patent Law Perspectives*, Annual Reviews B.1 [1][b].

being not so significant or material as to affect the essential operation of the circuit" 445 F.2d at 329. For the purposes of the claimed invention, therefore, the diodes and the triodes in the circuits did "operate in substantially the same way with substantially the same means to get substantially the same result." 445 F.2d at 329.

Likewise, this case is a classic case for denominating the doctrine of equivalents. Like *Tektronix*, the substantive findings of equivalence were established by the lower courts. In this case the only act which awaits is legal conclusion of equivalence by this Court in revitalizing and unfolding the methodology of its decision in *Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co.*, now twenty-five years removed.

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## CONCLUSION

This case presents the Court with an unprecedented opportunity of resolving *two* questions of substantial general and lasting importance to the patent laws. The first question is one of first impression for this Court, upon which a conflict in decisions among the courts of appeals has arisen. The second question involves a doctrine of tremendous importance to the application of the patent laws sorrily in need of revitalizing after twenty-five years without pronouncement by this Court. The petition should be granted.

Respectfully submitted,

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March 3, 1976

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# In the
# Supreme Court of the United States

OCTOBER TERM, 1975

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No. 75-1244

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WILBUR T. BOLKCOM and WILLIAM E. KNAPP,
*Petitioners,*

v.

THE CARBORUNDUM COMPANY,
*Respondent.*

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## APPENDIX
## TO PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SIXTH CIRCUIT

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District Court for the Eastern District of Tennessee, Northern Division, A. Sherman Christensen, J., the plaintiffs appealed. The Court of Appeals, McCree, Circuit Judge, held, inter alia, that the patent relating to more efficient and economical means of manufacturing silicon carbide was valid; that the claims of reissue patent were invalid; and that the district court's finding of fact that the defendants' turntable was not the equivalent of transfer car used in plaintiffs' plant so that there was no infringement was not clearly erroneous.

Affirmed.

**1. Patents ⇐18, 37, 46**

There are three essential elements of patent validity: novelty, utility, and nonobviousness. 35 U.S.C.A. §§ 101–103.

**2. Patents ⇐112.1**

Every patent issued by the Patent Office carries, at the outset, a presumption of validity which is justified by the complexities of patent law and the expertise of the Patent Office. 35 U.S.C.A. § 282.

**3. Patents ⇐112.1**

Where the most pertinent prior art has been considered by the Patent Office, the presumption of validity is greatly strengthened; conversely, where applicable prior art has not been considered by the Patent Office such presumption is greatly weakened. 35 U.S.C.A. § 282.

**4. Patents ⇐51(2)**

In order to anticipate an invention, prior art must have been reduced to use and successfully performed; even though imperfections and commercial difficulties may be revealed by reduction to practice, a device may nevertheless qualify as prior art.

**5. Patents ⇐51(2)**

Since proposals in company memoranda were never put into practice, they could not be considered as anticipating the patent relating to manufacture of silicon carbide.

**Wilbur T. BOLKCOM and William E. Knapp, Plaintiffs-Appellants,**

v.

**The CARBORUNDUM COMPANY, Defendant-Appellee.**

**No. 73–1320.**

United States Court of Appeals, Sixth Circuit.

Argued Oct. 5, 1973.

Decided Sept. 30, 1975.

A patent owner filed an action for infringement of a combination patent protecting the invention of a novel plan for manufacture of silicon carbide. From a judgment of the United States

**6. Patents ⇐45, 49**

The utility and novelty of plaintiffs' invention relating to more efficient and economical means of manufacturing silicon carbide were demonstrated by undisputed need of industry for a plant layout that would permit the continuous operation of the manufacturing process by selective movement of furnaces throughout its phases, and by the commercial success of plaintiffs' plant. 35 U.S.C.A. §§ 101–103.

**7. Patents ⇐40**

The fact that the elements included in plaintiffs' combination patent were found individually in prior art devices did not defeat novelty. 35 U.S.C.A. §§ 101–103.

**8. Patents ⇐17(2), 25, 26(2)**

A claimed invention is not patentable if it is a mere aggregation of all elements assembled with only mechanical skill; in order to be patentable a combination must produce a new result or a different function; the new invention must be more than the sum of the old parts. 35 U.S.C.A. § 103.

**9. Patents ⇐328(2)**

Patent No. 3,432,605 relating to more efficient and economical means of manufacturing silicon carbide was not obvious on consideration of the prior art since it constituted more than a mere aggregation of old elements in that new result of selectivity was a significant advance over the prior art; the element of selectivity made patent owners' plant a commercial success, solving an industry-wide problem. 35 U.S.C.A. § 103.

**10. Patents ⇐36.2(1)**

Because claimed invention was greater than the sum of its parts and produced a new result, the secondary considerations mentioned by the Supreme Court, including commercial success resulting from greatly increased efficiency, were relevant in determining validity. 35 U.S.C.A. § 103.

**11. Patents ⇐18, 37, 46**

Since patent relating to more efficient and economical means of manufacturing silicon carbide satisfied the requirements of novelty, utility, and non-obviousness, the patent was valid. 35 U.S.C.A. §§ 101–103.

**12. Patents ⇐141(1, 3)**

The statute relating to reissue of defective patents is intended only to permit the reissue of a new patent for the same invention as that disclosed in original patent in order to permit the correction of an innocent inadvertent defect or omission; it is not intended to permit the patentee to broaden the claims of the original patent; the new description of claims may not properly include additions to invention which were not described, suggested, nor substantially indicated in the original specifications, drawings, or patent office model. 35 U.S.C.A. § 251.

**13. Patents ⇐141(4)**

Claims added in reissue patent were invalid because they were an unauthorized enlargement of the disclosure in original patent relating to more efficient and economical means of manufacturing silicon carbide.

**14. Patents ⇐324.55(5)**

The district court's finding that company's turntable in manufacturing silicon carbide was not the equivalent of transfer car used in patent owners' plant was not clearly erroneous even though turntable performed substantially the same function as transfer car, where the way in which turntable accomplished result differed from that of the transfer car in that turntable itself was stationary and transferred the furnaces by pivoting around central point, while transfer car could move them about from location to location, and important practical consequences might result from such difference. 35 U.S.C.A. § 251.

**15. Patents ⇐178**

Where the patent is a pioneer, the patentee is allowed to claim a wide range of equivalents, but where the patent represents only a small but significant advance because the art is crowded, the doctrine of equivalents is given a

corresponding narrow range. 35 U.S. C.A. § 251.

---

J. W. Baker, Poore, Cox, Baker, McAuley, Ray & Byrne, Knoxville, Tenn., Walter J. Blenko, Thomas L. Sivak, Blenko, Leonard & Buell, Pittsburgh, Pa., for plaintiffs-appellants.

E. Bruce Foster, Sr., Knoxville, Tenn., William H. Webb, Webb, Burden, Robinson & Webb, P. A., David C. Bruening, Pittsburgh, Pa., for defendant-appellee.

Before WEICK, McCREE and LIVELY, Circuit Judges.

McCREE, Circuit Judge.

This is an appeal from the dismissal of an action by appellants, Bolkcom and Knapp, for infringement of a combination patent protecting the invention of a novel plant for the manufacture of silicon carbide. The patent in suit is Patent Re. 27,018 (hereinafter Patent '018) dated January 5, 1971, a reissue of Patent No. 3,432,605 (hereinafter Patent '605), dated March 11, 1969. The district court held that claims 11–14, which were added by the reissue, were invalid because they were an unauthorized enlargement of the disclosures of the original patent. It also held that the claims that were carried over from the original Patent '605 to the reissue were valid, but were not infringed by the appellee's plant because it employed an element not disclosed as part of the patented combination.

We agree that the broader claims added by reissue are invalid, that the original claims are valid, and that the accused plant does not infringe the original claims. We therefore affirm.

Silicon carbide (SiC), a compound said to be second in hardness only to a diamond, is used primarily for grinding wheels, other abrasive uses, and in refractories. It is made by fusing sand and a source of carbon like coke or graphite. Silica ($SiO_2$) and Carbon (C) react under extreme heat to produce silicon carbide. After the raw materials are mixed together and placed in a furnace, an electric resistant core is fired by passing an electrical current through it to raise the charge to the extremely high temperature (about 4,000 degrees F.) necessary to achieve the reaction product, silicon carbide. Silicon carbide was first made by Edward Acheson in 1891 and he founded The Carborundum Company, which today still enjoys the largest share of the total market for silicon carbide.

A significant feature of Acheson's process is that the furnaces must be fired in close proximity to the source of electrical power because of the capital expense and power losses which result from lengthened electrical leads. Insofar as the record shows, before appellants' invention was put into practice, all manufacturers of silicon carbide in North America relied upon the use of stationary, horizontal furnaces set in banks of four to six, close to one another and to the electrical source. The firing of a charge sufficient to form silicon carbide in the Acheson process takes about thirty hours. Hand labor is used in loading and unloading the furnaces, and the cramped working conditions resulting from the close proximity of the furnaces to each other and to the electrical source made this activity difficult and dangerous. After firing, the stationary furnaces required about three days to cool before workmen could unload them and load a new charge. Typically, the four furnaces in a bank attached to an electrical source were employed in a cycle of operations, with one furnace being loaded, one charging, one cooling, and one being unloaded. The total cycle—loading, charging, cooling, and unloading—took about five to seven days for each furnace.

The recognized industry need for more efficient and economical means of manufacturing silicon carbide was described in appellants' patent as follows:

> In the past silicon carbide has been manufactured in stationary electric furnaces. Such stationary furnace installations usually require four to six furnaces for each transformer in order

to utilize the transformer to its maximum efficiency, with one furnace heating, one being unloaded, one loading, and the remainder cooling. This requires very large capital investment in buildings and furnaces. The unloading of such furnaces is quite difficult and tedious because of the adjacent hot furnaces and because of the necessity of using large amounts of hand labor to remove the silicon carbide from the furnace due to the proximity of the adjacent furnaces and the difficulty of using mechanical unloading equipment in the restricted floor space available. This also requires that the furnaces be cooled [a]n extraordinary long time before unloading in order to get the temperature down to the point where the hand labor can be effectively used. A further problem arises in the loading of such furnaces because of the adjacent other furnaces. This means lengthy conveyor belts from the mixing bins to the furnaces or overhead cranes carrying successive bucket loads to the furnace.

The district court found that "[t]here has always been a need in the industry for a more facile, economical and efficient way of making silicon carbide."

To meet this need, appellants in 1964 conceived of a method of using *mobile* furnaces that could be removed from the electrical source after being fired, placed at a distance for cooling and stripping, and then moved to another area of the plant for reloading before again being moved to the electrical source for charging. Appellants' layout for manufacture also embraced the advantage of selectivity—the ability to move any furnace car for cooling, unloading, and loading, without disturbing the position of any other furnace car. This was to be accomplished by means of a "transfer car" on a set of rails transverse to the primary rails leading to the firing area and to another set of rails leading to other areas in the plant where loading and unloading operations could more efficiently be accomplished. Thus, a mobile furnace could be rolled atop the transfer car, and the loaded car could be moved selectively in and out of alignment with the various trackways leading, on the one hand, to the firing area and, on the other hand, to the other plant areas for cooling, loading, and unloading.

Appellants successfully put their invention into practice in April 1966 by constructing their Satellite Plant at Springdale, Pennsylvania, where they began the commercial manufacture of silicon carbide. After this plant began operations, appellants' patent counsel prepared and filed the application that matured into the original Patent '605. The preferred mode of their invention was disclosed in the patent, coupled with the required detailed specification, as follows:

> This invention relates to silicon carbide furnaces and plants and particularly to a silicon carbide furnace which can be fired in one position, removed to a second position for cooling, and unloading and to a plant incorporating a plurality of such furnaces.
>
> • • • • • •
>
> Preferably we provide an electrical power source, a main trackway adjacent said power source, a furnace bottom mounted on wheels on said trackway movable to and away from said power source, said furnace bottom having a substantially flat heat resistant surface, removable sides along each side of said surface and removable ends on said surface, said sides and ends defining a heating chamber, electrode means in each of said ends, removable connections between said electrode ends and said power source, a transfer car movable transversely to the main trackway and having a corresponding trackway adapted to be aligned with the main trackway to receive the furnace bottom wheels and furnace whereby said furnace may be moved transversely to said main trackway, a service area spaced from said main trackway by said transfer car, secondary trackways in said service area receiving said furnace from said transfer car, loading means at said

service area adapted to load said furnace and a cooling and unloading section in said service area spaced from the loading means. Preferably the loading means is a gravity discharge hopper or the like located over a trackway adapted to receive a furnace to be loaded from the transfer car. Other loading device and conveying equipment, may of course, be used. The removable ends of said furnace are preferably provided with cooling means removably connected to a source of coolant adjacent the power source whereby the electrodes in the ends can be cooled.

Claim 1 is representative of claims 1–10 in the original patent. It states:

We claim:

1. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway adjacent said power source, a furnace car movable on said trackway to and from said power source, a refractory bottom on said car, removable side and end panels on said refractory bottom of said furnace car, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and electrode means, a transfer car movable on a trackway extending transversely to the main trackway, said transfer car carrying a trackway corresponding to said main trackway and alignable with the main trackway receiving the furnace car therefrom, a service area opposite the main trackway and spaced from said main trackway by said transfer car, a secondary trackway on said service area receiving said furnace car from said transfer car trackway, loading means in the service area for loading said heating chamber while on said secondary trackway and an unloading section in said service area spaced from the loading means and receiving a completed furnace charge from said furnace car.

After putting their invention into practice in their own plant, and while their patent application was pending, in May 1967, appellants, seeking to enter into a licensing agreement, showed their plant layout to employees of appellee Carborundum Company. At least since 1965, appellee had been conducting substantial research on the feasibility of using mobile furnaces but had been unable to achieve in practice, or even in a fully developed theory, the successful result put into practice by appellants in their Satellite Plant.[1]

Thereafter, appellee proceeded to build a plant at Jacksboro, Tennessee, in which virtually all elements of appellants' manufacturing plant were duplicated, with the single exception that in appellee's Jacksboro plant, instead of a transfer car running on a track transverse to the

1. As stated in a memorandum prepared by Carborundum Company employees for internal corporate consideration:

> Don Gillmore and myself visited Messrs. Knapp and Balcom [sic] of the subject Corporation on May 12 to discuss their low cost process for manufacturing silicon carbide, on which they have filed a patent application.
>
> As we suspected, the claims are related to a car furnace operation and the savings are in lower initial capital investment plus lower labor costs primarily in material handling. *This is identical with our thinking except they have reduced it to practice in their new plant at Springdale, Pennsylvania.*
>
> They were most frank in their discussion and gave us full details of their operation. We have copies of their patent application, a breakdown of capital costs and similar information on labor costs. They contacted us because we are the largest producer of silicon carbide. They do not intend to contact other producers and request that we do not discuss this openly where it might become generally known to others in the trade. They anticipate it might take from two to three years for the Patent Office to rule on their application. They suggested if Carborundum were to indicate definite interest in a licensing arrangement with them it could expedite the application through the Patent Office. They are interested in the sale of a process whereby they could treat it as a capital gain. Possibly they might consider selling their Company, although we did not explore this. We did tell them our position on development of a car furnace type of plant. [Emphasis added.]

main trackways,[2] a railroad turntable supported by rails at its periphery was used.

On March 11, 1969, the original patent application was granted.

Meanwhile, by August 1969 appellants had learned that The Carborundum Company planned to build a plant at Jacksboro using a turntable to shunt mobile furnace cars selectively into and out of the firing area, and into and out of other areas of the plant. In 1969, after meeting with patent counsel to discuss the scope of their original patent, appellants filed a reissue application to cover transfer means other than the transfer car on a transverse track that was described in the initial claims. For example, it was intended by this reissue to obtain coverage for the use of turntables, ladder track, or overhead crane mechanisms in place of the transfer car. The application for reissue was filed on November 20, 1969. Appellants' patent counsel in a letter to associates engaged in obtaining foreign patents for appellants' invention stated the purpose for the reissue application in the following manner:

> Our client has just filed a reissue application in the United States on the United States patent corresponding to the above identified Canadian patent. The purpose of the reissue is to enlarge the claims. They have found that a turntable and several other mechanisms can be substituted for the transfer car of the issued claims and feel that the transfer car limitation is too limiting.

During a deposition before trial, appellant Knapp conceded that the letter reflected the purpose of the reissue application. At trial, he qualified his answer, testifying that appellants and their counsel believed that any turntable resting on rails at its periphery was a "transfer car" within the literal meaning of their claims, and that they intended the reissue only to extend their claims to turntables rotating on a central pivot. Appellant's patent counsel testified at trial that at the time the cited letter was written, he believed that a turntable like that used by appellee was covered by the original claims, but that he wanted to write to his associates in "simplified language."

The reissue patent, '081, was granted on June 5, 1971. Typical of the new claims added, 11–14, is claim 11, which is identical to claim number 1 in substance except that it provides for achieving the desired selectivity through the use of a "transfer means" instead of a "transfer car on a track transverse to the main trackway."

Appellee's Jacksboro plant was placed in operation about April 1971 and about one year later the action for infringement was filed.

The district court held that the original claims of the patent, which expressly claim as an element of the invention a transfer car upon a transverse track, are not literally infringed by a combination virtually identical in all other respects except that it employs a turntable instead of a transfer car to achieve the selectivity function. The court found that a turntable was a "distinctly different mechanism from a transfer car," and therefore the turntable system was not

2. There was evidence indicating that appellee decided to use an old turntable instead of a transfer car in order to save about $90,000. An internal memorandum stated:

> MiX 980
> J. W. Golding 01–3 3 September 1968
> R. C. Anderson 66–1 L. D. Schultz 66
> SIC CRUDE PLANT
> DEVELOPMENTS 8-26-68 to 8-30-68
> I. *H. G. Acres Co., 8-25-68* –
>
> On Thursday morning, I visited H. G. Acres and reviewed the project with Harold Rose and Jack Robson.
>
> *The most significant development since last we met was that Jack Robson has come up with a scheme which would utilize a surplus railroad turntable in place of the transfer car previously planned. Jack and Harold estimate this could save us about $90,000.* [Emphasis added]

equivalent to the transfer car arrangement. Further, although a turntable apparently falls within the broader reissue claims coverage of a "transfer means," the court held that reissue claims 11–14 are invalid under 35 U.S.C. § 251 because they are "not addressed to the invention disclosed in the original patent" and, instead, are an "unauthorized enlargement of the disclosures of the patent."

## THE VALIDITY OF THE ORIGINAL '605 CLAIMS

We first consider the validity of the original claims of Patent '605, which were carried over in the reissue patent. These are claims 1, 3, 4, 5, & 9. Claim 1, set forth above, is representative.

[1] As we stated in *Westwood Chemical, Inc. v. Owens-Corning Fiberglass Corp.*, 445 F.2d 911 (6th Cir. 1971), *cert. denied*, 405 U.S. 917, 92 S.Ct. 941, 30 L.Ed.2d 786 (1972), there are three essential elements of patent validity: novelty, utility and non-obviousness. These requirements are codified in 35 U.S.C. §§ 101–103.

[2, 3] In applying this test, we begin with the principle that every patent issued by the patent office carries, at the outset, a presumption of validity, 35 U.S.C. § 282, which is justified by the "complexities of patent law and the expertise of the patent office." *Monroe Auto Equipment Co. v. Heckethorne Mfg. & Supply Co.*, 332 F.2d 406, 412 (6th Cir.), *cert. denied*, 379 U.S. 888, 85 S.Ct. 160, 13 L.Ed.2d 93 (1964). And where the most pertinent prior art has been considered by the patent office, the presumption is greatly strengthened. *Tapco Products Co. v. Van Mark Products Corp.*, 446 F.2d 420 (6th Cir.), *cert. denied*, 404 U.S. 986, 92 S.Ct. 451, 30 L.Ed.2d 370 (1971). *See also Great Lakes Equipment Co. v. Fluid Systems, Inc.*, 217 F.2d 613, 617 (6th Cir. 1954). Conversely, "where applicable prior art has not been considered by the Patent Office this presumption is greatly weakened." *Dunlop Company, Ltd. v. Kelsey-Hayes Co.*, 484 F.2d 407, 413 (6th Cir. 1973), *cert. denied*, 415 U.S. 917, 94 S.Ct. 1414, 39 L.Ed.2d 471 (1974), *Monroe Auto Equipment Co., supra.*

Here, appellee, in challenging the validity of the original patent, cites as relevant prior art not considered by the Patent Office six patents, and two confidential inter-corporate reports circulated by its employees. Moreover, appellee contends that this prior art is more pertinent to the patent claims in issue than that considered by the patent office, because the examiner did not consider any patents concerned with mobile silicon carbide furnaces.

## PRIOR ART

The following prior art not considered by the Patent Office was cited by appellee.

*1. Bayard Patent No. 1,107,478.*

The Bayard patent relates to a plant for the manufacture of silicon carbide having moveable electric furnaces. It shows two parallel batteries of eight furnaces each, mounted on wheels for movement along trackways from a furnacing area to a service area. Each furnace has removable end walls equipped with electrodes. Before a battery of furnaces can be moved, the end walls must be removed from all eight furnaces and replaced with false end walls. Further, the electrical wiring system requires all furnaces in a battery to be operating at the same time. The trackways leading to the firing area permit the furnaces to be moved outside for cooling, emptying, and loading a new charge. While one battery of furnaces is being serviced, the other can be charged.

*2. German Patent No. 854,207 (hereinafter Demag).*

The Demag patent likewise pertains to a plant for the manufacture of silicon carbide in moveable electrical resistance furnaces. Wheeled frames or trucks carry the vertical furnaces, which are made up of separate wall sections clamped or hinged together during

charging or firing. The furnaces are in groups of three, which must be used simultaneously. The groups of furnaces move on a frame or truck over a trackway to the electrical source, then back down the tracks to a turntable where they are positioned to move onto tracks leading to the servicing area.

*3. Tone Patent No. 800,515.*

This patent is directed to an electrical resistance furnace for making silicon carbide, graphite, siloxicon, and for heating other carbon articles. The furnace has removable sidewall panels composed of bricks held together by frames of iron or other materials. The panels rest on the furnace floor when in position and are withdrawn by a crane at the end of a furnace run.

*4. Van Wagenen Patent No. 492,069.*

This patent shows a turntable having wheels located at its periphery which ride on a track as the turntable rotates.

*5. Koppers Patent No. 1,674,985.*

This patent relates to a furnacing plant for burning fireproof ware. It shows a preheating channel, furnaces, and cooling chambers connected by tracks, with cars that move on the tracks, sliding platforms, and transversely extending trackways on which the sliding platforms move.

*6. Lloyd Patent No. 2,504,707.*

This patent shows a plant for heating ingots for the manufacture of steel using transfer cars and tracks extending transversely to the main furnace trackway.

**[4, 5]** Appellees also rely upon two Carborundum Company internal memoranda regarding plans for mobile silicon carbide furnaces.[3] However, there was no showing that these two proposals were ever reduced to practice prior to the construction of appellants' plant. In *Monroe Auto Equipment, supra,* we held that in order to anticipate an invention, prior art "must have been reduced to use and successfully performed." 332 F.2d 415. More recently, in *Dunlop Co., Ltd. v. Kelsey-Hayes Co., supra,* we reiterated this holding with the qualification that even though imperfections and commercial difficulties may be revealed by reduction to practice, a device may nevertheless qualify as prior art. Therefore, since the proposals in the Carborundum Company memoranda were never put into practice, they cannot be considered as anticipating the '605 patent.

## UTILITY AND NOVELTY

**[6]** The utility and novelty of appellants' invention is demonstrated by the undisputed need of the industry for a plant layout that would permit the continuous operation of the manufacturing process by the selective movement of furnaces throughout its phases, and by the commercial success of appellants' plant. William Bolkcom's deposition testimony indicated that appellants' silicon carbide accounted for 8–10 percent of the total output in the United States and Canada.

**[7]** Moreover, the fact that the elements included in appellants' combination patent were found individually in prior art devices does not defeat novelty. *King-Seeley Thermos Co. v. Refrigerated Dispensers, Inc.,* 354 F.2d 533 (10th Cir. 1965). As the court stated in *Shaw v. E.B. & A.B. Whiting Co.,* 417 F.2d 1097, 1101 (2d Cir.), *cert. denied,* 397 U.S. 1076, 90 S.Ct. 1518, 25 L.Ed.2d 811 (1970):

3. The Carborundum proposal dated 1956 describes a silicon carbide plant having moveable furnace cars each of which is to be moved by a "transfer mechanism" from a loading area to a furnacing area. The furnaces pass through the furnacing area to another "transfer mechanism" which moves them through a cooling area to tracks passing through an unloading area.

The June 1965 Carborundum proposal describes a mobile furnace plant where furnace cars travel on tracks and are moved in a direction transverse to these tracks on transfer tracks through the various phases of silicon carbide manufacture. The "mobile furnace plant" was one of fourteen new concepts described in the report.

an equivalent result. In summary, the district court specifically found that appellants' claimed invention was not a mere aggregation of old elements, but instead it was "a combination in which the product exceeds the sum of the individual elements," producing a new result of selectivity. This new selectivity was a small but significant advance over the prior art in a relatively crowded field.

**[9]** We agree with the district court that the '605 patent was not obvious. The Bayard and Demag patents both lacked the element of selectivity. The Bayard patent showed furnaces in batteries of eight, and all eight furnaces had to be operated at the same time; further, all eight end walls from the entire battery had to be removed and replaced by false end walls before the individual furnaces could be moved away to the stripping area. The Demag patent differs significantly from appellants' because it shows vertical, not horizontal, furnaces, arranged in groups of three which had to be moved as single units. The Tone, Van Wagenen, Koppers, and Lloyd patents simply show that the individual elements of removable furnace side walls, turntables, and transfer cars on transverse tracks were part of the prior art. They fail to show that appellants' combination of these elements, and others, was obvious.

We agree with the district court that appellants' invention was more than a mere aggregation of old elements. The new result of selectivity was a significant advance over the prior art. It was precisely the element of selectivity that made appellants' plant such a commercial success, solving an industry-wide problem.

**[10]** Moreover, the secondary considerations enumerated by the Supreme Court in *Graham v. John Deere* all strongly support the conclusion that appellants' invention was not obvious. The appellants' plant was a commercial success that had captured 8–10 percent of the North American market for silicon carbide. It met the longstanding industry need that inspired appellee's own research efforts beginning as early as 1950. Finally, appellee's failure, despite its preeminence in the field, to duplicate appellants' invention after years of sustained effort strongly supports the district court's conclusion that the invention was not obvious to a person with only ordinary skill in the art. We agree with appellee that the result of increased efficiency from a mere mechanical aggregation of old elements is not patentable. But here, because the claimed invention is greater than the sum of its parts and produces a new result, the secondary considerations mentioned in *Graham v. John Deere*, including commercial success resulting from greatly increased efficiency, are relevant.

**[11]** Since we hold that appellants' original '605 patent satisfies the requirements of novelty, utility, and non-obviousness, we agree with the district court that the original patent is valid.

## THE VALIDITY OF THE REISSUE CLAIMS 11–14

The district court found the reissue claims 11–14 are invalid as an "unauthorized enlargement of the disclosure in the patent." Appellants contend that the disclosure of an invention in the preferred form or "best mode" should not prevent the inventor from claiming every form in which the invention might be copied.

We agree that the trial court applied the proper standard in determining whether the reissue claims were valid. 35 U.S.C. § 251 provides in part:

> Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he had a right to claim in the patent, the Commissioner shall, on the surrender of such patent and the payment of the fee required by law, reissue the patent for the invention disclosed in the original patent, and in accordance with a new and amended

However, the fact that each element of a creation sought to be patented is found in prior art does not negate novelty if the old elements are combined in such a way that as a result of the combining an improved, useful, and more advantageous innovation is obtained.

NON-OBVIOUSNESS

We turn next to the more difficult question whether within the meaning of 35 U.S.C. § 103 appellants' invention was obvious. Section 103 provides:

> *A patent may not be obtained* though the invention is not identically disclosed or described as set forth in section 102 of this title, *if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.* Patentability shall not be negatived by the manner in which the invention was made. [Emphasis added.]

Appellee argues that the claimed invention was obvious in view of the prior art, particularly because it was a mere aggregation of old elements.

In *Graham v. John Deere Co.*, 383 U.S. 1, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966) the Supreme Court interpreted the section 103 standard of "obviousness" as intended to codify the prior judicial standard of "invention." The Court gave obviousness a practical definition:

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy. See Note, Subtests of "Nonobviousness": A Nontechnical Approach to Patent Validity, 112 U.Pa.L.Rev. 1169 (1964). 383 U.S. 17–18, 86 S.Ct. 694.

[8] Further, in considering cases dealing specifically with inventions that combine elements that were known as part of the prior art, the Supreme Court has developed some specialized criteria for obviousness. In *Great A & P Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 150, 71 S.Ct. 127, 129, 95 L.Ed. 162 (1950), Justice Jackson writing for the Court, cautioned that the "concept of invention is inherently elusive when applied to combination of old elements." A claimed invention is not patentable if it is a mere aggregation of old elements assembled with only mechanical skill. In order to be patentable a combination must produce a new result or a different function; the new invention must be more than the sum of the old parts. *Anderson-Black Rock, Inc. v. Pavement Salvage Co., Inc.*, 396 U.S. 57, 90 S.Ct. 305, 24 L.Ed.2d 258 (1969); *Great A & P Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 71 S.Ct. 127, 95 L.Ed. 162 (1950); *Grinnell Washing Machine Co. v. E. E. Johnson Co.*, 247 U.S. 426, 38 S.Ct. 547, 62 L.Ed. 1196 (1918).

The district court found that the '605 patent was not obvious on consideration of the prior art. The court found that although the prior art disclosed the concepts of moveable furnaces, transfer cars, and other elements used in the '605 patent, the novel combination invented by appellants produced the new result of facile and unencumbered selectivity. In contrast, appellee's unsuccessful attempts to design a mobile furnace were simply obvious combinations or aggregations of known elements. The court observed that despite appellee's hindsight argument that the '605 patent was obvious, nevertheless, its own experts, who devoted years of effort, failed to achieve

application, for the unexpired part of the term of the original patent. *No new matter shall be introduced into the application for reissue.* [Emphasis added.]

[12] The Supreme Court has made it clear that this section is intended only to permit the reissue of a new patent for *the same invention* as that disclosed in the original patent in order to permit the correction of an innocent inadvertent defect or omission. It is not intended to permit the patentee to broaden the claims of the original patent. The new description of claims may not properly include

> additions to the invention which were not described, suggested, nor substantially indicated in the original specifications, drawings, or patent-office model. . . . Letters patent reissued for an invention substantially different from that embodied in the original patent are void and of no effect . . . . *Parker and Whipple Co. v. Yale Lock Co.*, 123 U.S. 87, 97–99, 8 S.Ct. 38, 44, 31 L.Ed. 100 (1887).

For example, in *U. S. Industrial Chemicals, Inc. v. Carbon Carbide & Chemicals Corp.*, 315 U.S. 668, 678, 62 S.Ct. 839, 86 L.Ed. 1105 (1942) the Court held that:

> the omission from a reissue patent of one of the steps or elements prescribed in the original, thus broadening the claims to cover a new and different combination, renders the reissue void, even though the result attained is the same as that brought about by following the process claimed in the original patent.

Bolkcom acknowledged at his deposition, and Knapp at trial, that the original patent referred only to a transfer car, but they contended that the claim includes a turntable with wheels located at its periphery. They also conceded that they intended the reissue to cover other transfer means, such as a ladder track or a turntable rotating on a central pivot. This concession is consistent with their letter to foreign associates, *supra*, in which patent counsel described the purpose of the reissue as "to enlarge the claims."

[13] We hold that the record clearly supports the district court's conclusion that the claims added in the reissue patent were invalid because they were an unauthorized enlargement of the disclosure in the original patent. The reissue claims, like those in *U. S. Industrial Chemicals*, were intended to broaden the claims in order to cover several new and different combinations. Therefore, as in *U. S. Industrial Chemicals*, the reissue is void even though the combinations using the other transfer means achieved the same result as appellants' original invention.

## INFRINGEMENT

Since we have already held that the district court was correct in determining that the original patent is valid and the reissue claims are invalid, we now turn to the claims of the original patent to determine whether it was infringed by appellee's plant. The district court found that the appellee's plant, although virtually identical with appellants' in every other respect, utilized a turntable instead of a transfer car to transport the mobile furnaces. It found that the turntable was not a transfer car, and did not accomplish substantially the same results by substantially the same means. Instead, it found that the turntable is "an essentially different means" that is "not the equivalent" of appellants' invention.

Appellants argue that appellee's combination, including a turntable, infringes their original patent both literally and under the doctrine of equivalents. Considering first the argument that there was a literal infringement of the original patent, we are not persuaded that a "turntable" is included within the definition of a "transfer car." Not only was there testimony that appellee's device is commonly referred to in the art as a turntable, rather than as a car, but also there was testimony that a transfer car can move from one location to another, but a turntable has a fixed location and merely rotates around a central pivot.

However, under the doctrine of equivalents, appellee's plant must also be found to infringe if the turntable and the transfer car do substantially the same work in substantially the same way and accomplish substantially the same result. *Graver Tank & Mfg. Co., Inc. v. Linde Air Products*, 339 U.S. 605, 70 S.Ct. 854, 94 L.Ed. 1097 (1950). The *Graver* Court stated that this doctrine is available to the holders of combination patents as well as primary patents, and the area of equivalence will vary under the circumstances of individual cases, the prior art, and the context of the patent. It also held that the existence of equivalence is a question of fact.

**[14]** Applying this test, we hold that the district court's finding of fact that appellee's turntable was not the equivalent of the transfer car used in appellants' plant is not clearly erroneous. The turntable does perform substantially the same function as the transfer car: each serves as the device that moves the mobile furnaces into alignment with the main trackway leading to the firing area, then out of alignment with that trackway and into alignment with other trackways to the stripping and loading areas. However, the way in which the turntable accomplishes this result differs from that of the transfer car. As observed above, the turntable itself is stationary and transfers the furnaces by pivoting around a central point, but the transfer car can move them about from location to location. Important practical consequences may result from this difference. For example, the number of separate locations which can be served by the turntable may be limited by the number of tracks that can abut its circumference. Also, a number of transfer cars carrying furnaces can move about simultaneously on various portions of appellants' trackways. However, it would appear that only one furnace at a time can be transferred by the turntable.

**[15]** Where the patent is a pioneer, the patentee is allowed to claim a wide range of equivalents. But where, as here, the patent represents only a small but significant advance because the art is crowded, the doctrine of equivalents is given a correspondingly narrow range. *Triax Co. v. Hartman Metal Fabricators, Inc.*, 479 F.2d 951 (2d Cir.), *cert. denied*, 414 U.S. 1113, 94 S.Ct. 843, 38 L.Ed.2d 740 (1973), *Parmalee Pharmaceutical Co. v. Zinc*, 285 F.2d 465 (8th Cir. 1961).

In view of our holding that appellee's plant does not infringe under the doctrine of equivalents, we do not reach appellee's additional argument that file wrapper estoppel would also preclude a finding of infringement because in the prosecution of the patent in suit the inventors narrowly restricted the scope of their claims.

Affirmed.

**NO. 73-1320**
**UNITED STATES COURT OF APPEALS**
**FOR THE SIXTH CIRCUIT**

WILBUR T. BOLKCOM, and
WILLIAM E. KNAPP,
*Plaintiffs-Appellants*

- vs -

THE CARBORUNDUM
COMPANY,
*Defendant-Appellee,*

**ORDER**

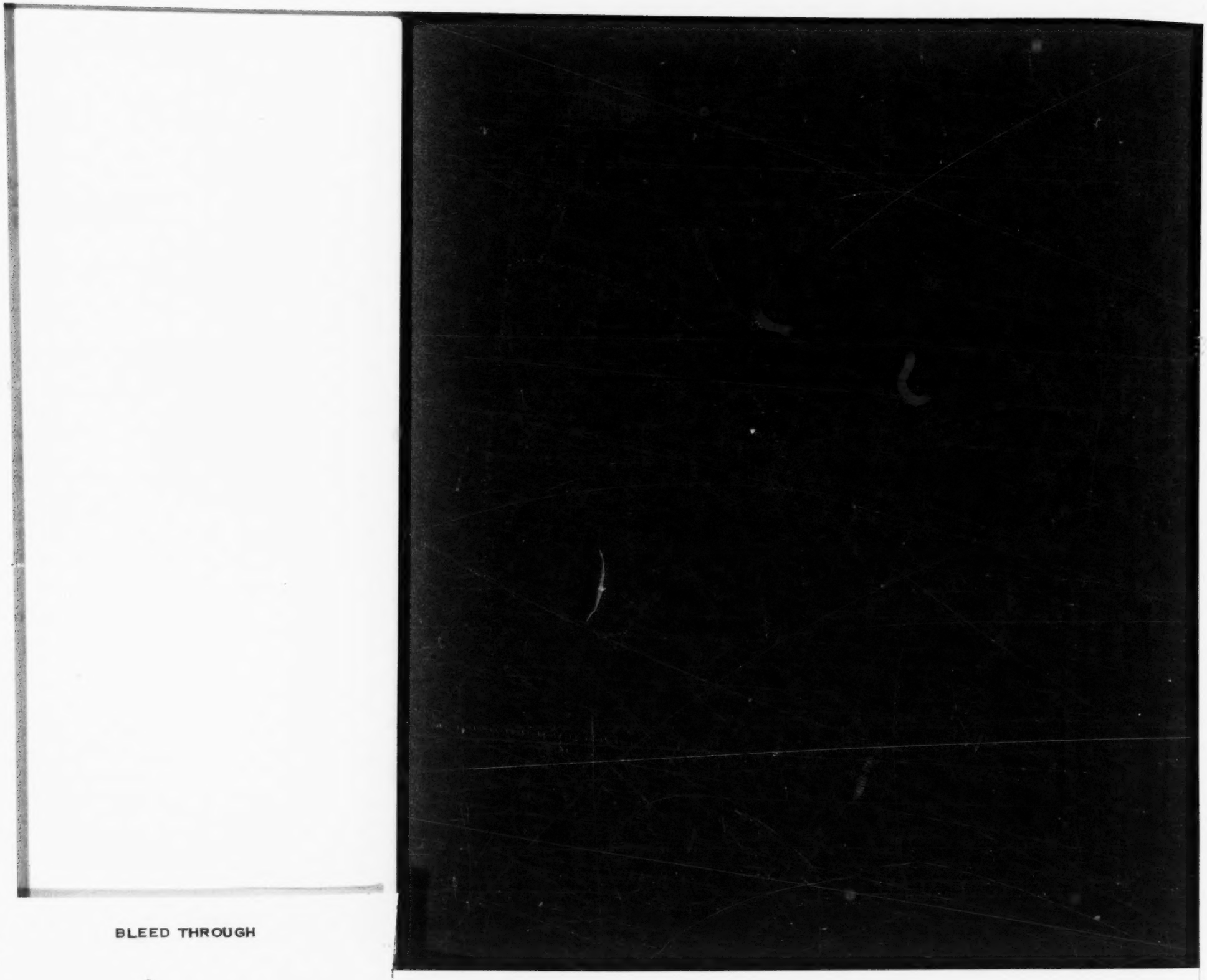
BEFORE: WEICK, MC CREE, and LIVELY, Circuit Judges.

The petition for rehearing with suggestion for a rehearing en banc having come on to be heard, and no judge having requested a vote on the suggestion for en banc consideration, and the petition having therefore been referred to the panel that heard the case, upon consideration, it is ORDERED that the petition be, and it hereby is, DENIED.

Entered by order of the court

...../s/ JOHN P. HEHMAN.....
*Clerk*

**FILED**
DEC. 4, 1975
JOHN P. HEHMAN, Clerk



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*Opinion.*

**Opinion**

* * * * * * *

[654] *The Court*: The matter is submitted, Gentlemen?

*Mr. Webb*: Yes, your Honor.

*Mr. Blenko*: Yes, your Honor.

*The Court*: First, then, a word of appreciation. I am certainly mindful of the experience and ability [655] of counsel, of which I have been the beneficiary.

I want to thank you for the diligent and able manner in which the case has been presented.

The Court could have been in difficulty in timing, not that I wouldn't be able to devote whatever time was necessary for proper disposition of the matter; but, because all protracted cases pose problems for the Court as a whole, had it not been for this focused presentation.

The Court could have been in difficulties in seeing the points involved if these were masked by time or obtuse argument. And I am in your debt on both scores.

Next, a word of apology and explanation. I apologize to you and your clients for utilizing so much of this daily transcript in interjecting questions and making comments. I certainly must apologize for the form of some of those comments.

I notice on page 504, for instance, that one of the comments, consisting of fifteen lines is almost unintelligible and is reflected in a single sentence.

Perhaps the Reporter would be charitable, — you Gentlemen be — in reading such long sentences, with the thought it would have made sense had it [656] been

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reflected in six sentences as follows, quote: "With reference to the last witness there were other reasons that might put him in a little stronger status as an expert or as a witness in a proper sense" period. "He didn't prepare the applications involved" period. "There is some suggestion in the pleadings, if not in the pretrial order, that the defendant makes some claim of deceptive intent of some consequence beyond mere omission in any event, particularly with regard to the last letter where point has been made that it was written in disclosure of prior art before the original patent issued" period. "There may not be a hole in the record as to whether any subsequent failure to re-issue patent on the reliance upon the original patent had consequences akin to that which might have resulted from deceptive intent."

I think "on" should have been "if", then it makes sense.

I solace my shock in reading those barbaric long sentences with the thought that perhaps I didn't pause sufficiently between the sentences. And the Reporter can assume that he wasn't supposed to break it up into sentences because of the words running out too thoughtlessly.

[657] Be charitable when you read these transcripts. If my words could fall as brightly and crisply minted as counsel's do on the record, it would indeed be great.

The explanation of this means of deciding the case, and the clarifying questions and discussions that I have participated in, or invited, stems from my history as a trial attorney.

When, in the early years of practice before a fine Judge, who decided cases simply by a grunt, I never

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knew what was in his mind. And months after I might find that I was talking to points that didn't interest him at all, and that he decided on the case on something that hadn't occurred to me.

When I took the Bench I made up my mind that I would never leave counsel in that position. So, I go to the other extreme.

But, I think counsel have the right to know generally the operation of the Court's mind, so that for good or ill, or validity, or invalidity, the Court has used a general type of thinking to which counsel can come to grips. I think I have at least tried to give you that indication.

Furthermore, with regard to the decision itself, I have tried to, whenever feasible, during [658] my later years as a Judge, to follow the evidence through transcripts and examination of exhibits as the case goes on so that at the end of the case, in the context of counsel's arguments, I can at least knowledgeably, according to my lights, come to conclusions.

[659] The first case that I attempted that system in, some ten years ago, by interesting coincidence involved an electron furnace. It was a case brought by Monsanto Chemical Company against the defendant for alleged violation of trade secrets.

I felt that I approached most nearly a knowledgeable decision in that case, and it was an issue of great moment to both sides, than if I had taken the matter under long advisement. I departed from that rule in the case I mentioned yesterday where by reason of counsel's request that transcript be provided before briefing and

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then an extended period of briefing, my decision was reached some year after the trial. If I have achieved the proper result in that case, it would be against a tremendous obstacle for any judge to try to reconstruct a hotly contested case and the evidence with reference to numerous issues out of the context of the trial, and after memory becomes certainly a little dull. Even the re-reading of the transcript, which I did, didn't give me the assurance that I would have had, if I had done the best I could during the course of the trial, and then attempted to reach a decision in context.

Now as to the particular plan of decision here. I think I am as fully advised as I reasonably could be [660] expected to be on the law of the case, within my limitations, since I have read, I think, most, if not all of the authorities cited in the original briefs and at least rescanned or read most, if not all, of the authorities cited in your proposed conclusions, since I have tried to keep abreast of the exhibits, both in court and in the course of the examination and out of court.

I would propose to indicate my basic views on the crucial issues of the case, and then by reference refer to various proposed findings which will be indicated as generally acceptable or unacceptable, subject always to their modification to be harmonious with the views to be now expressed.

I will ask counsel for one side or the other, based upon such statement, to redraft proposed findings of fact and conclusions of law, submit them to the opposing side, if feasible; since you are both from Pittsburgh, you might discuss or interchange the findings so that

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they are deemed as acceptable as possible as a matter of form, for joint submission to the Court.

I state here, and you may rest assured, that your agreement as to form will not be taken as a waiver of any substantive position, because it would be inherent in such a submission that you reserve your substantive [661] positions.

I would like, however, to feel that the findings and conclusions reflected an appropriate record of my decision so that neither side by mere form would be prejudiced.

I suggest that you eliminate from the conclusions, even though I indicated adoption of certain conclusions, the citations. I find that counsel often are able to agree upon it, that conclusions are in accordance with the trial court's determination, but can't agree upon the citations to support them, each wishing, depending upon the interest, to have a little more effective or a little less effective citations to the conclusion.

So let's avoid that problem. Your citations are reflected in the record and your proposals, proposed findings and conclusions will be on record, so we will have continuing reference to those, together with citations in your trial briefs.

We have involved here a combination patent. Manifestly, we do not deal with a formula in the field of chemistry or mechanical apparatus, but a combination in respect to a manufacturing plant. Such a combination does not lend itself readily to any spectacular or extraordinary or unexpected result. But if such rather [662] prosaic combinations are susceptible of such, I can't

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escape the conviction that this is one of them, that this is a combination in which the product exceeds the sum of individual elements.

As has been appropriately remarked during the course of the trial, the concept of novelty or invention is a fugitive one in many ways. It is an oversimplification to say that the heart of the plaintiffs' invention was the selectivity. It permitted facile and unencumbered selectivity, to permit the treatment in various stages of the material involved in the manufacture of carborundum.

I agree that it is probably both an oversimplification and accurate statement to say part of the invention was non-orbital treatment in the course of that process and the utilization of the plant layout. But again, I can't escape the conviction that plaintiffs did, indeed, invent a new and novel combination which was useful, which was not anticipated by the prior art, and which was not obvious within the contemplation of Section 103. [663] I believe that the defendant's combinations, so far as indicated by the record, up to the time its agents viewed the plaintiffs' plant may have been an exact example of the combinations simply amounted by way of product to the total of its constituent parts.

It is now well and good to say that the turntable treatment, or the transfer treatment involved in the patent in suit, or the Jacksboro Plant, would be quite obvious to those skilled in the art, but the experts of the companies with the greatest experience in this field didn't come up with such a combination until the plaintiffs developed it.

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Hindsight can always render matters obvious as we have been frequently reminded in justification both of good and bad decisions on the question of obviousness. I can find nothing in the prior art, however, which would render in my considered judgment this invention obvious.

The fact itself that having before them the concept of mobile furnaces, of transfer cars, of every other idea suggested by the prior art, the defendant companies' experts did not come up with plaintiffs' invention until it was made and reduced to practice by plaintiffs, is relevant both to the [664] question of the significance of the prior art both disclosed before the Patent Office and undisclosed before the Patent Office and the general problem of obviousness.

Up until the time of the plaintiffs' invention the defendant's ideas appeared practical, promising, and at least in the defendant's judgment novel. I have read exhibits restricting discussion of these matters because of the new concept that the defendant thought it had, and yet realistically in view of the plaintiffs' disclosure and the disclosure of the Jacksboro Plant these other ideas seem somewhat cumbersome and primitive.

We have talked about the *sine qua non* of selectivity whereby without any interference with any particular furnace, other furnaces in plurality may be moved from the furnacing area into the processing area and returned. It is a rather simple thing in a way but very significant thing within narrow limits. That is the *sine qua non*. But that isn't to deprecate the other elements of the combination because it is not an invention simply with respect to that which may well have

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been anticipated by the prior art in a limited or narrow sense but the combination itself with that important element found [665] no other place represented in the invention.

Thus I conclude that in a crowded art the plaintiffs' invention, as reflected in the original application, represented a small step, but a significant step, beyond the art and a step that was not obvious in view of the art whether disclosed or undisclosed.

The next concept that governed my decision is in the field of equivalents. This is not to say that this next point is governed only by consideration of the doctrine of equivalents because there are other matters relating to the file history and with reference to the very nature of the disclosure of the patent itself which leads to or renders meaningful the same result.

[666] *The Court*: There are other matters relating to file history and with reference to the very nature of the disclosure of the patent itself, which leads to, or renders meaningful the same results.

The turntable system involved in the Jacksboro Plant is not the equivalent of the plaintiffs' invention, whether considered simply in gross or the generality, or whether the turntable device is specifically compared with the transfer car element.

The most simplified example within my experience of the application of the doctrine of equivalents was in the Sears Roebuck case which went to the Tenth Circuit in which — from the District of Denver, I determined that the mere reversal of parts, so that a member camming on the toggle of a toggle wrench was in essentially the same position as a toggle wrench in which the

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member cammed upon another member against the toggle. You can move from that area to more complex comparisons where the doctrine of equivalents applies.

But I don't think that the plaintiffs' turntable system —

*Mr .Webb*: You mean the defendant's?

*The Court*: I should say defendant's turntable system accomplished the same result in the [667] same way. I grant that it accomplishes the same result of the susceptible of that accomplishment, but it is by an essentially different means. No transfer car is used.

The furnace car itself becomes the transfer car. There is not a plurality of tracks utilized in connection with the transfer itself superimposed upon a transfer car or a multiple use of a single track. If we could cut loose from the file history of the case, and from the inherent nature of the plaintiffs' invention, a pretty good case could be made under the doctrine of equivalency. But, strictly speaking, I don't think the two means are essentially the same. I think there are important differences.

If the closeness of that problem, however, were the only element in this field, I wouldn't proceed with quite as much assurance as I feel I can in distinguishing the two means. The expressed and essential nature of the plaintiffs' invention as disclosed by the specifications, and by the claims, as well as the file history, bring me to the same result. Beyond that, if the plaintiffs' invention were so broadly interpreted as to read upon the turntable system involved in the Jacksboro Plant, there would be grave doubts in my mind as to [668] its compliance with section 103. It would be essentially to fall

BLEED THROUGH

*Opinion.*

into fallacious reasoning in this aspect and too much to take at face value some of the transitory arguments advanced by both parties here.

Defendant says that the turntable system is essentially different with respect to the issue of infringement from the transfer system disclosed by the patent.

There is a temptation to parlay that mere argument into a significant differentiation in the prior art between the turntable approach and the transfer approach.

On the other hand, the plaintiff said the turntable was within the disclosure, it was just a matter of formal drafting, that it wasn't set out in the claims. And if indeed that argument is parlayed to its logical conclusion, it might follow that this *sine qua non* that we have been talking about is disclosed in the basic patent was really the equivalent of the old turntable as exemplified in Bayard.

Aside from this—these merely formal points and counterpoints, there is something more basic in the invention of the plaintiff which [669] dictates in my judgment that the plaintiffs' invention must be narrowly construed, and was, indeed, narrowly accepted in the context of the transfer car system.

[670] And as so narrowly accepted and construed, represented, as I have indicated, a significant step forward, a significant advance in the art in view of all of the art that has been disclosed before the Patent Office or otherwise.

In sum I don't think the turntable was disclosed, as a part of the patented combination, or taught. If it were

BLEED THROUGH

*Opinion.*

within the reach of the patent or were an inventive idea, in view of the prior art as such, it was dedicated to the public domain by failure to claim it, and by expressly in the patent application itself and by representation to the Patent Office, tying the invention to the transfer system specifically.

The plaintiffs are not in a position to claim that Jacksboro application constituted an infringement of the patent in suit.

It goes without saying then in the Court's view that the re-issue claims, except as reiterating the claims of the original patent, are invalid as constituting an unauthorized enlargement of the disclosures of the patent. And in the context of the issues of this case, it may be that the rationale of this decision would affect other types of application. That question isn't before me though and whether a ladder type or an overhead control type of application would be a similar [671] extension, I don't think I am called upon to decide. Except by the essential logic of any position that the Court takes in theory as to these other things, there is certainly no intent at all to make an adjudication of the non-infringing nature of any variation except as to that exemplified or embodied in the Jacksboro application.

I followed to the best of my ability the discussions in connection with Bayard and the German patent. I am inclined to agree generally with plaintiffs, that their disclosure would not and did not render the plaintiffs' patent as I have interpreted it, anticipated or obvious.

Again I returned to the defendant's embodiment of their ideas of mobile furnaces and transfers, et cetera.

BLEED THROUGH

*Opinion.*

With all they knew, all their experience, their specific application of all their research and thinking to the Carborundum context, plaintiffs' invention wasn't obvious to them. They missed it. They had far more than the Examiner would have had before him, if he had had all of the additional prior art before him. I think the rationale of the Examiner's determination would continue in view of the additional prior art, as well as before it, with respect to the invention as so narrowly interpreted. [672] Coming to the matter of clean hands, which bothered the Court in connection with other points. I was impressed last night with some assumed duty on the part of plaintiffs to render explanation to satisfy any possible or at least reasonable surmise that there could have been deceptive intent or a significant withholding. I have concluded that, at least to the minimal that could be expected, there has been a showing that the Bayard patent could not be regarded as significant or determinative.

[673] I have considered the presumption with regard to that prior art and with regard to the total prior art not disclosed in the Patent Office to have been dissipated, that is, the presumption of validity as against that additional prior art.

I think the defendant's counsel is quite right. I have not sought to split hairs on whether it is a mere reduction or a weakening or a dissipation. As far as that prior art is concerned it has been completely dissipated in my view. In any reflection, by looking at the matter realistically, I still am of the opinion that invalidity is not established as a matter of law and obviousness is not established as a matter of fact. Quite to the contrary.

BLEED THROUGH

*Opinion.*

I am impressed with the argument today that the failure of disclosure prior to the issuance of the patent was not a significant failure, as I have mentioned. I still think that counsel, out of circumspection, should have made the disclosure.

In re-evaluating problems like that it is difficult to take into consideration all of the surrounding circumstances and another's judgment when not confronted with them may be different as the situation appeared at the time.

My lingering criticism of counsel in not [674] making adequate disclosure must yield to a realization that in order to establish the lack of clean hands there must be something even beyond preponderence of the evidence perhaps. That is a serious matter. Perhaps that, in order to be recognized, must be established by at least a clear preponderance of the evidence or by clear and convincing evidence.

Be that as it may, as I consider the burden of proof the problem becomes somewhat unimportant. The lack of clean hands, as I understand it, is an affirmative defense. It might be suggested that one having shown a failure of disclosure, the burden of persuasion shifts for an explanation to the plaintiff, but the burden of proof, I suppose, continued with the defendant and the explanation having been made on the record here of the non-controlling effect of the undisclosed prior art, there being no indication beyond that that there was deceptive intent, the affirmative defense may fail merely on the basis of burden. However, looking at it realistically and having explored all arguments to the best of my ability, I cannot sustain the defense of lack of clean hands.

BLEED THROUGH

*Opinion.*

I will direct counsel for the plaintiffs to take the laboring oar in drafting the Findings of [675] Fact and Conclusions of Law consistent with the views herein expressed.

I find most of the findings on either side as proposed are very quite objective and factual. There are some argumentative matters included, and Mr. Webb has suggested certain findings which represent no ultimate findings or somewhat argumentative findings in view of the decision of the Court, but on the whole they are factually supported.

I would think that plaintiffs 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15, with the emphasis on the key element as reflected in 15, are in a satisfactory form generally. They must be modified a little to comport with the other things I have mentioned.

Of course, the conclusions suggest themselves, particularly the fact that claims 11 and 14 are an enlargement of the invention disclosed and taught in the parent patent.

As construed, conclusions as to utility and novelty proposed by the plaintiffs are in order.

I think, without running through these any more, the conclusions will suggest themselves. Manifestly, the conclusions with regard to file wrapper estoppel as proposed by plaintiffs would not be congruous with the Court's ideas. The [676] conclusion as to unclean hands, in light of what I have said, seem to be generally acceptable, or with regard to clean hands, more properly.

Defendant's conclusions with regard to file wrapper estoppel are all right.

I am not so sure, Mr. Webb, that file wrapper estoppel in a usual or its limited sense applies in its more

BLEED THROUGH

*Opinion.*

inherent nature of the patent itself as revealed in the statement before the Patent Office. It may be that file wrapper estoppel is a little different animal. It is where there has been an abandonment of a position upon a question which is sought to be recovered.

*Mr. Webb*: I would agree with that, your Honor. I think it is a matter of utilizing the file wrapper for the purpose of constructing —

*The Court*: That is right. I believe I feel more comfortable to put it upon that basis rather than in the terms of file wrapper estoppel.

*Mr. Webb*: I agree with your Honor. [677] Well, the conclusions with regard to the lack of infringement as suggested by the defendant is generally all right.

Now, in finding 11 for instance, Mr. Knapp — I should say Mr. Webb, you emphasize and quote a letter in which Mr. Knapp sets out the features as if they were the whole thing.

Well, after all, that is consistent with the disclosures you have found, but letters don't make a patent.

And maybe that is argumentative, but it is certainly true he said that.

Your proposed finding 13, of course, refers to mobile furnaces and makes the mobility of the furnace almost the *sine qua non* of the invention. And that is not consistent with what I have indicated. And I don't mean to foreclose some of the findings you have proposed, sir. To be realistic about it, there are many that could be included for the completion of the record. But I don't want to use any of them argumentatively to becloud the findings that I have made consistent with the views here expressed.

BLEED THROUGH

*Opinion.*

*Mr. Webb*: I think, your Honor, we can modify them adequately to take out the argumentative [678] aspect.

*The Court*: Can you Gentlemen work together on that and get a set of findings which you think realistically present the problem?

*Mr. Webb*: We certainly will try.

*The Court*: And light up any error or validity in my conclusions.

For instance, your 16 appears okay, 17 appears okay, 18 and 19.

All right, so much for that, Gentlemen.

Now, in all candor, it is not an easy case on the Bayard and the German patent disclosures in this area of novelty. But I have done the best I can and I believe that I am right. If I am not, rather than have a long process of arguing about little refinements in the findings, and so forth, let's lay it on the line as best we can along these lines. And if you have any overriding conviction that requires you to get off a little steam as to the Court, waive oral arguments and make your motion for modification of the findings under Rule 52(b), or modification of the judgment under 59(a). And submit the matter on briefs and I will listen to you at length. But I won't occupy any more of your time here on oral argument.

[679] Is that all right?

*Mr. Webb*: Yes, indeed, your Honor, I think that is workable.

*The Court*: Thank you, Gentlemen.

We will stand in adjournment.

(Whereupon, Court was adjourned at 1:10 P.M.)

BLEED THROUGH

*Findings of Fact and Conclusions of Law.*

IN THE
UNITED STATES DISTRICT COURT
FOR THE
EASTERN DISTRICT OF TENNESSEE
NORTHERN DIVISION

| | |
|---|---|
| WILBUR T. BOLKCOM and WILLIAM E. KNAPP, Plaintiffs, v. THE CARBORUNDUM COMPANY, Defendant. | Civil Action No. 7840 |

**Findings of Fact and Conclusions of Law**

FINDINGS OF FACT

*Nature of Action*

1. This is an action for infringement of United States Letters Patent Re. 27,018, dated January 5, 1971, a reissue of Patent No. 3,432,605, dated March 11, 1969, for "Silicon Carbide Furnaces and Plants" both granted to plaintiffs, Wilbur T. Bolkcom and William E. Knapp.

*Parties*

2. Plaintiffs are citizens of the United States, residing in Allegheny County, Pennsylvania.

3. Defendant, The Carborundum Company, is a Delaware corporation, having a regular and established place of business at Jacksboro in the Eastern District of Tennessee.

4. Plaintiffs are and always have been the owners of Patent 3,432,605 and Patent Re. 27,018.

*Findings of Fact and Conclusions of Law.*

*Subject Matter of Litigation*

5. This litigation is concerned with a combination patent in respect to a plant for the manufacture of silicon carbide.

6. Silicon carbide (chemical formula SiC) does not exist in nature. It was first made and discovered by Edward Acheson in 1891 and was named "carborundum" by him. It is the reaction product of silica ($SiO_2$) and carbon (C). The reaction is brought about by subjecting a charge consisting essentially of sand and coke to terrific heat (about 4,000° F.) produced by an electric current, for a prolonged period of time (about 30 hours). Acheson organized The Carborundum Company, defendant herein, in 1891 to exploit his discovery. The basic patent on carborundum and its manufacture (Patent No. 492,767) issued on February 28, 1893, and was reissued on February 26th, 1895 (Patent Re. 11,473). Carborundum, next in hardness to the diamond, has remarkable abrasive properties, and it was originally exploited by Acheson and defendant as an abrasive. Other large industrial uses were subsequently developed, e.g., as an ingredient in refractory products, as a deoxidizer for molten steel and as an additive fuel in basic oxygen steelmaking.

7. After the Acheson invention, others entered upon the manufacture of silicon carbide in competition with defendant, but defendant is and always has been the largest silicon carbide manufacturer on the North American continent probably equal to all the rest combined. So far as the record discloses, until April, 1966, when plaintiffs' "Satellite" Plant (hereinafter described) went into operation, all silicon carbide manu-

facture in North America had been in stationary, horizontal, trough-like furnaces built close to one another (about 15 feet) and arranged in "banks" of four to six.

8. The raw materials used and the furnacing process practiced today for the manufacture of silicon carbide are essentially the same as those disclosed in the early Acheson patents. Practices in mixing the ingredients have been progressively improved. Materials handling equipment, i.e., mechanical equipment for loading and unloading the furnaces, has been devised and is in common usage. The charge consists essentially of a granular mix of sand, coke and recycled "old mix" separated from previous runs. An electrical resistor consisting of a granular mix of coke and graphite is buried in the charge and extends from one end of the furnace to the other. The necessary heat is generated by passing an electric current through the resistor, causing the charge material immediately around the resistor to react. The furnacing of a charge takes about thirty hours. After the current is turned off, the furnace has to stand for about three days before it is cool enough for workmen to unload ("strip") it. After stripping, a new charge is built up in the furnace. Stripping and loading require the presence of workmen at the furnace site. A cycle of operation of each furnace in the bank takes five to seven days.

9. The plant area is necessarily large. The electrical supply installation (transformer, leads to the furnaces, etc.) is expensive and must be used as continuously as possible because of overhead charges and the economics of power rate structures. It cannot be used continuously for a single furnace because of the down

*Findings of Fact and Conclusions of Law.*

time required for cooling, stripping and loading. The furnaces are therefore arranged in banks, each of whose furnaces is supplied in turn with the current from a single transformer. The leads from the transformer to the several furnaces in the bank are kept as short as possible out of consideration of capital cost and power losses which inevitably occur if the leads are lengthened. This requires that the furnaces in the bank be located close together. The loading and stripping operations are carried out in close quarters under adverse conditions created by the firing of nearby furnaces from which carbon monoxide, carbon dioxide and sulphur are evolved. If a furnace has to be repaired, the repairs must be made *in situ* while the power to the furnace is off.

10. There has always been a need in the industry for a more facile, economical and efficient way of making silicon carbide.

11. Plaintiffs were classmates in Metallurgical Engineering at the University of Pittsburgh (class of 1940) and since 1948 they have been partners in various enterprises related to the iron and steel industry. Commencing in or about 1950, they went into the business of collecting "scrap" silicon carbide, e.g., the butts of worn-out abrasive wheels, and crushing and packaging it for metallurgical uses. Their venture was successful, and they soon encountered a shortage of scrap material to salvage and had to fill this requirement by purchasing waste material and new product from silicon carbide manufacturers. The cost was higher.

12. In or about 1954, plaintiffs concluded that they would have to manufacture silicon carbide if they were to continue in the business they had built up. Having

*Findings of Fact and Conclusions of Law.*

some knowledge of the Acheson-type plant and its costliness, plaintiffs between 1955 and 1963 expended more than $200,000 in a series of studies and experiments to find a new process. They experimented with vertical shaft furnaces, traveling grate furnaces, fossil-fired gas furnaces, plasma jet furnaces, and a number of other furnaces. They employed engineers who were knowledgeable in the relevant technology. None of these efforts was successful.

13. Plaintiffs concluded that they would have to build an Acheson-type plant, as everyone in the industry had done from the beginning. Upon making inquiries of the Blaw-Knox Company, which had built The Carborundum Company's plant at Vancouver, Washington, in the early 1950's, they received estimates of the cost of such a plant, and the estimates ranged from $2,000,000 to $3,000,00 for a plant capable of producing 6,000 tons annually to $3,500,000 for a plant capable of producing 8,000 tons annually. Such costs for a plant were prohibitive for plaintiffs.

14. Late in 1964, plaintiffs conceived the invention of the patent in suit. The invention was completely reduced to practice in early April, 1966, by the construction of plaintiffs' Satellite Plant at Springdale, Pennsylvania, and the commercial manufacture of silicon carbide therein beginning April 6, 1966.

15. On November 3, 1965, before the Satellite Plant was completed, plaintiff Knapp, in initiating efforts to obtain patent protection, wrote to patent counsel as set forth in DX-20.

16. After the Satellite Plant went into operation in 1966, plaintiffs' patent counsel saw the plant and

then proceeded with the preparation and filing of the application which eventuated into the original Patent No. 3,432,605.

17. Shortly prior to March 6, 1969, plaintiffs learned that Carborundum was planning to build a facility at Jacksboro for making silicon carbide. Prior to August, 1969, plaintiffs had knowledge that the Jacksboro facility was to be a mobile furnace type and that a turntable was to be used in the Jacksboro facility.

18. In August, 1969, Bolkcom and Knapp met with their patent counsel and discussed the fact that Carborundum was going to use a turntable, and they concluded that the significance of their patent should be carfully explored in regard to alternate forms of transfer mechanism.

19. In October, 1969, a decision was reached to file a reissue application in an attempt to cover alternate means to the transfer car setup described and illustrated in the original patent. These alternate means were turntables, ladder tracks and overhead cranes. The application for the reissue patent was filed on November 20, 1969.

20. Shortly after the filing of the reissue application, plaintiffs' patent counsel, in a letter to his Canadian associates in regard to the purpose of the reissue application, stated:

> "Our client has just filed a reissue application in the United States on the United States patent corresponding to the above identified Canadian patent. The purpose of the reissue is to enlarge the claims. They have found that a turntable and sev-

eral other mechanisms can be substituted for the transfer car of the issued claims and feel that the transfer car limitation is too limiting."

On the same date, plaintiffs' counsel stated substantially the same thing in a letter to a New York patent firm.

21. The reissue patent in suit, Re. 27,018 was granted on January 5, 1971, and the Complaint in this action was filed by plaintiffs in April, 1972, about one year after the Jacksboro Plant of Carborundum was placed in operation.

*The Patent in Suit*

22. The patent in suit discloses a new combination of elements which incorporates four essential concepts. The concepts are (i) a multifurnace firing area with stations for independently firing the several furnaces, these stations being close enough to one another to minimize the capital cost and electrical operating cost; (ii) a service area remote from the furnacing area and having a stripping station and a separate loading station, where the stripping and loading operations can be carried out, free from the crowded and adverse conditions of the firing area and the pollutants present there; (iii) mobile furnaces so constructed and arranged that they can be moved from one station to another with their loads intact, and emptied at the stripping station; and (iv) a transversely moving transfer car which enables the operating personnel to put any furnace selectively through its full operating cycle — loading, furnacing and stripping — without having to move another furnace from the firing area or interrupt the operating cycle of any other furnace in any way.

*Findings of Fact and Conclusions of Law.*

23. The specification and drawings of the patent in suit are based upon and accurately illustrate and describe plaintiffs' Satellite Plant. They do not illustrate or describe any transfer means other than a "transfer car movable on a trackway extending transversely to the main trackway." The specification and drawings of the original patent and of the reissue patent are identical.

24. The patent in suit discloses a specific plant layout for manufacturing silicon carbide in movable furnaces. In the layout, a furnace car is positioned on a trackway adjacent to a transformer and electrodes carried in the end walls of the furnace car are connected to the transformer. The charge of silica and carbon is fired to form silicon carbide, and the electrodes are disconnected. The furnace car is then moved on to a transfer car which carries a trackway which may be aligned with any trackway in the furnacing area. The transfer car has wheels which run on tracks which extend transversely to the trackways in the furnacing room and the trackways in the servicing area. The transfer car is then moved so that the trackway thereon registers with a trackway on the stripping floor and the furnace car is moved onto that trackway. At the stripping station, the sides are removed and the silicon carbide and any unfired charge material are pushed off the bottom of the car. The car is then moved back onto the transfer car and is moved to a point where the trackway on the transfer car is in alignment with a trackway on the loading floor. The furnace car is moved to the loading station where it is charged. The furnace car is then moved back onto the transfer car, which is moved into alignment with a desired trackway in the furnacing area. The furnace car is then moved adjacent

*Findings of Fact and Conclusions of Law.*

to a transformer where the electrodes are connected and the charge is fired.

25. Each furnace car has removable side and end walls, but the end walls remain in place during all of the operations mentioned above. The side walls are formed in panels or sections and at the stripping station the side panels are lifted from the furnace bottom so as to provide access to the fired charge so that it can be readily removed.

26. The specification describes and the drawings illustrate only the utilization of a transfer car with a trackway on the upper surface thereof, the transfer car being movable back and forth on a trackway which is located in a pit and which extends transversely to the trackways in the furnacing area and in the servicing area.

27. During the prosecution of the application which eventuated into Patent No. 3,432,605, the patentees represented to the Patent Office in distinguishing over the prior art that their "new combination" which they claimed included a main trackway adjacent a power source, a furnace car movable on the trackway, removable side and end panels on the car, electrode means in each end panel, "a transfer car movable transverse to the main trackway and carrying a corresponding trackway adapted to be aligned with the main trackway," a service area spaced from the main trackway by the transfer car, a secondary trackway in the service area, and an unloading and loading means in the service area.

28. After the claims were rejected by the Patent Office on certain prior art, in an Amendment dated

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November 7, 1968, in distinguishing over the prior art, the plaintiffs pointed out that there was "no transfer car" as called for in the claims disclosed in the prior art, that there was "no transfer means receiving the car and moving it transversely to the main trackway" and that the prior art did not disclose a "transfer car moving transversely of the main trackway."

29. The patent in suit contains 14 claims. Claims 1-10 inclusive appeared in the original patent, No. 3,-432,605, and claims 11-14 inclusive were added by reissue. Claim 1 is representative of the original claims. It is for a combination of 15 elements and it states their inter-relationship in detail. Stated in diagram form it reads as follows:

A silicon carbide manufacturing plant comprising—

(1) An electrical power source,

(2) a main trackway adjacent said power source,

(3) a furnace car movable on said trackway to and from said power source,

(4) a refractory bottom on said car,

(5) - (6) removable side and end panels on said refractory bottom of said furnace car,

said side and end panels being interconnected to form a heating chamber on said car,

(7) electrode means in each end panel,

(8) removable connections between said power source and electrode means,

*Findings of Fact and Conclusions of Law.*

(9) a transfer car movable on

(10) a trackway extending transversely to the main trackway,

(11) said transfer car carrying a trackway corresponding to said main trackway and alignable with the main trackway receiving the furnace car therefrom,

(12) a service area opposite the main trackway and spaced from said main trackway by said transfer car,

(13) a secondary trackway on said service area receiving said furnace car from said transfer car trackways,

(14) loading means in the service area for loading said heating chamber while on said secondary trackway,

(15) and an unloading section in said service area spaced from the loading means and receiving a completed furnace charge from said furnace car.

30. Each of claims 1-10 is limited to the use of "a transfer car movable on a trackway extending transversely to the main trackway" (elements (9) and (10) of Finding 29). Claims 11-14, added by reissue, are broader; e.g., claim 11 calls for "transfer means" between the first and second trackways selectively delivering a furnace car from one to the other. The stated reason for the presentation of claims 11 to 14 in the reissue application was that the claims of the original patent did not adequately define the invention.

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31. The Complaint and Answer herein placed in issue the validity of all the claims of the patent in suit. Plaintiffs charge infringement of claims 1, 3, 4, 5, 9 and 11-14 inclusive.

*The Validity Issue*

32. The patent in suit is a combination patent — a patent on a combination in respect to a manufacturing plant.

33. Such a combination as that covered by the patent in suit does not lend itself readily to any spectacular or extraordinary or unexpected result; but if such rather prosaic combinations are susceptible of such, then this is one of them; that is, this is a combination in which the product exceeds the sum of the individual elements.

34. It is an oversimplification to say that the heart of plaintiffs' invention was selectivity. It permitted facile and unencumbered selectivity to permit the treatment in various stages of the material involved in the manufacture of carborundum.

35. It is both an oversimplification and an accurate statement to say that part of the invention was non-orbital treatment in the course of the process and the utilization of the plant layout, but again plaintiffs did invent a new and novel combination which was useful, which was not anticipated by the prior art, and which was not obvious within the contemplation of §103.

36. The *sine qua non* of the invention is selectivity, whereby without any interference with any particular furnace other furnaces in plurality may be moved from

*Findings of Fact and Conclusions of Law.*

the furnacing area into the processing area and returned. This is a rather simple thing, but a very significant thing within narrow limits.

37. The prior art patents and printed publications relied upon by defendant are:

| | | |
|---|---|---|
| Haugh et al. | No. 251,341 | dated December 20, 1881 (DX-50) |
| Van Wagnen | No. 492,049 | dated February 21, 1893 (DX-51) |
| Tone | No. 800,515 | dated September 26, 1905 (DX-52 and 52A) |
| Bayard | No. 1,107,478 | dated August 18, 1914 (DX-53, 53A-C) |
| Koppers | No. 1,674,985 | dated June 26, 1928 (DX-54 and 54A) |
| Lloyd | No. 2,504,707 | dated April 18, 1950 (DX-55) |
| German Demag | No. 854,207 | published February 21, 1952 (DX-56, 56A-B) |

The Making, Shaping and Treating of Steel (1964 ed.), pp. 702-703 (DX-57)

None of this prior art was before the Patent Office when it considered the original application or the reissue application eventuating into the patent in suit.

38. Defendant also relied upon internal reports circulated within The Carborundum Company and known to many of Carborundum's personnel relating to mobile furnace plants for manufacturing silicon carbide. These are as follows:

*Findings of Fact and Conclusions of Law.*

Staff Engineering Report entitled "Proposed New SiC Furnacing Facility with Movable Furnace Bed" dated in 1955 (PX-25; DX-58)

Memorandum Golding to Gilbert dated in 1960 (PX-42)

Special Report entitled "New Concepts in SiC Furnace Design" dated June 22, 1965 (PX-26; DX-59)

These reports were not published and not available to the public generally and were not before the Patent Office.

39. In view of the content of the specification and drawings of the original and reissue patents, the representations made to the Patent Office, and the prior art, plaintiffs' invention must be narrowly construed and, indeed, was narrowly accepted by the Patent Office in the context of the transfer car system.

40. In a crowded art, the plaintiffs' invention, as reflected in the original application, represented a small step but a significant step beyond the art and a step that was not obvious in view of the art, whether disclosed or undisclosed. There is nothing in the prior art which would render plaintiffs' invention obvious.

41. The disclosures of the Bayard Patent and the German Patent No. 854,207 did not render the plaintiffs' patent as interpreted by the Court anticipated or obvious.

42. When narrowly interpreted, plaintiffs' invention was not obvious to the Carborundum employees; and the rationale of the Examiner's determination of

*Findings of Fact and Conclusions of Law.*

patentability would continue in view of the additional prior art when the invention is narrowly interpreted as stated herein.

43. Up until the time of the plaintiffs' invention, the defendant's ideas appeared practical, promising and, at least in the defendant's judgment, novel. Yet, realistically, in view of the plaintiffs' disclosure and the disclosure of the Jacksboro Plant, these other ideas seem somewhat cumbersome and primitive.

44. Having before them the concept of mobile furnaces, of transfer cars, of every other idea suggested by the prior art, defendant's experts did not come up with the invention until it was made and reduced to practice by plaintiffs.

45. The experts of the companies with the greatest experience in this field did not come up with the plaintiffs' combination until plaintiffs had developed it.

46. The plant layouts which defendant had prior to the time its agents viewed plaintiffs' plant are apt examples of combinations in which the product amounted to the total of the constituent parts.

47. The original Bolkcom et al. Patent No. 3,432,-605 makes no mention of any transfer arrangement other than that shown in the drawings and specifically disclosed in the specification and defined in the claims thereof. There is no support in the original Bolkcom et al. application or patent for any transfer arrangement other than one employing the transfer car and the transverse track arrangement shown, described and claimed therein. The original patent and the representations made to the Patent Office in the procurement

*Findings of Fact and Conclusions of Law.*

thereof show that the patentees did not intend to cover or embrace any transfer arrangement except one employing a transfer car and trackways for the transfer car extending transversely, to the main trackway in the furnace area and the secondary trackway in the servicing area.

48. The claims added by reissue, i.e., claims 11-14, inclusive are broader than the original claims; they are not supported by the specification and drawings of the original patent and constitute an unauthorized enlargement of the disclosures of the patent.

*The Infringement Issue*

49. Plaintiffs charge defendant with infringement of the patent in suit by reason of defendant's ownership and commercial use of a mobile furnace silicon carbide manufacturing plant at Jacksboro, Tennessee.

50. The Jacksboro Plant has a firing area spaced apart from a stripping area, a cylinder cooling area, a maintenance area and a charging area. A turntable in a circular pit lies between the firing and the loading and stripping areas. The turntable rotates on a centrally located pivotal support and has wheels running on a circular track near the periphery which provides peripheral support to the turntable. The turntable has a trackway which is alignable with trackways in the firing, loading and stripping areas. The trackways in these areas radiate from the periphery of the pit. A furnace may be moved from one area to another by first aligning the track on the turntable with the trackway in that area, moving a car furnace by means of a locomotive onto the trackway on the turntable, rotating the turntable into

*Findings of Fact and Conclusions of Law.*

alignment with the desired trackway and moving the car furnace from the turntable onto that trackway.

51. The Jacksboro Plant does not embody a transfer car arrangement. A turntable is a distinctly different mechanism from a transfer car.

52. The turntable employed by defendant was never disclosed or taught to be a part of plaintiffs' patented combination. If it were deemed to be within the reach of the patent or an inventive idea, it was dedicated to the public domain by failure to claim it, and by expressly, in the patent application itself and by representations to the Patent Office, limiting the invention specifically to the transfer car system.

53. The turntable system employed in the Jacksboro Plant of defendant is not the equivalent of the plaintiffs' invention whether considered in gross or whether the turntable device is specifically compared with the transfer car arrangement.

54. Defendant's turntable system does not accomplish the same result in the same way; and it is an essentially different means since no transfer car is used.

55. Defendant's turntable arrangement and the arrangement shown in the patent in suit are not essentially the same — there are important differences.

56. The expressed and essential nature of the plaintiffs' invention as disclosed by the specification and by the claims as well as the file history require the conclusions just stated.

57. There is no infringement of any claim of the patent in suit by Carborundum's Plant at Jacksboro, Tennessee.

*Findings of Fact and Conclusions of Law.*

*The Unclean Hands Defense*

58. Even though it discloses mobile furnaces for the manufacture of silicon carbide, the Bayard Patent does not render the claims of the patent in suit invalid. Hence, the failure of Mr. Buell to call the Bayard Patent to the attention of the United States Patent Office when he learned of it by reason of its having been cited against a Norwegian application does not render the patent in suit unenforceable.

59. At least to the minimal that could be expected, there has been a showing that the Bayard Patent could not be regarded as significant or determinative.

60. Counsel for the applicants out of circumspection should have disclosed the Bayard Patent to the Patent Office. However, the defense of lack of clean hands has not been made out by a clear preponderance of the evidence or by clear and convincing evidence.

CONCLUSIONS OF LAW

1. The Court has jurisdiction over the parties and the subject matter of this civil action under 28 U.S.C. 1338(a) and venue is properly laid in the Eastern District of Tennessee, Northern Division, under 28 U.S.C. 1400(b).

2. There is pertinent prior art before this Court which was not considered by the Patent Office during the prosecution of the applications leading to the original and reissue patents. As far as that prior art is concerned, the presumption of validity (35 U.S.C. §282) has been completely dissipated; but looking at the mat-

*Findings of Fact and Conclusions of Law.*

ter realistically the Court concludes that invalidity is not established as a matter of law and obviousness is not established as a matter of fact. Quite to the contrary.

3. The patent in suit satisfies the legal requirements of 35 U.S.C. 101. The combination is such that the product exceeds the sum of the individual elements. The claims are for a new and useful combination that comes within the statutory class of a "manufacture".

4. The patent in suit satisfies the legal requirements of 35 U.S.C. §102. The claims are not anticipated by any of the patents and publications cited or relied upon by defendant or by any of its own internal reports.

5. The Court concludes that in a crowded art the plaintiffs' invention, as reflected in the original application, represented a small step, but a significant step, beyond the art and a step that was not obvious in view of the art whether disclosed or undisclosed to the Patent Office. Hence, the patent in suit satisfies the legal requirements of 35 U.S.C. §103.

6. If the plaintiffs' invention were so broadly interpreted as to read upon the turntable system employed in the Jacksboro Plant, the Court would have grave doubts as to its compliance with §103.

7. Defendant has not sustained its burden of proof of establishing invalidity of claims 1-10 of the patent in suit, when the claims are narrowly interpreted to cover the specific transfer car mechanism described and illustrated in the patent, and these claims of the patent are adjudged valid.

*Findings of Fact and Conclusions of Law.*

8. Claims 11-14, inclusive, of the patent in suit fail to comply with the requirements of 35 U.S.C. §251 in that they are not addressed to the invention disclosed in the original patent and constitute an unauthorized enlargement of the disclosures of the patent and are invalid.

9. Since a turntable was not disclosed or taught as a part of the patented combination and in view of the prior art and the representations made to the Patent Office and the patent application itself tying the invention to the transfer system specifically, plaintiffs are in no position to claim that the Jacksboro installation constituted an infringement of the patent in suit.

10. Plaintiffs have not sustained their burden of proof of infringement, and the defendant's accused plant is held not to infringe any claim of plaintiffs' patent.

11. The turntable system at defendant's Jacksboro Plant is not the equivalent of the plaintiffs' invention, whether considered simply in gross or in general, or whether the turntable device is specifically compared with the transfer car element.

12. Defendant has the burden of establishing the defense of unclean hands by clear and convincing evidence.

13. The Bayard patent was not significant to or determinative of the patentability of the patent in suit and there was no burden on the plaintiffs to cite the Bayard Patent to the attention of the Examiner.

*Findings of Fact and Conclusions of Law.*

14. Defendant has not sustained its burden of proof to establish the defense of unclean hands.

---

United States District Judge

Approved as to form:

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*Judgment.*

**Judgment**

AND NOW, to wit, this 14th day of March, 1973, the Court having considered all issues of validity, enforceability and infringement of plaintiffs' Patent Re. 27,018 in suit and having entered its findings of fact and conclusions of law thereon, holding *inter alia* that defendant has not infringed said patent, it is hereby

ORDERED, ADJUDGED AND DECREED that the Complaint be and hereby is dismissed.

And it is further ORDERED that each party shall bear its own costs.

A. SHERMAN CHRISTENSEN
United States District Judge

Jan. 5, 1971 W. T. BOLKCOM ET AL Re. 27,018

SILICON CARBIDE FURNACES AND PLANTS

Original Filed Feb. 23, 1967 4 Sheets-Sheet 1

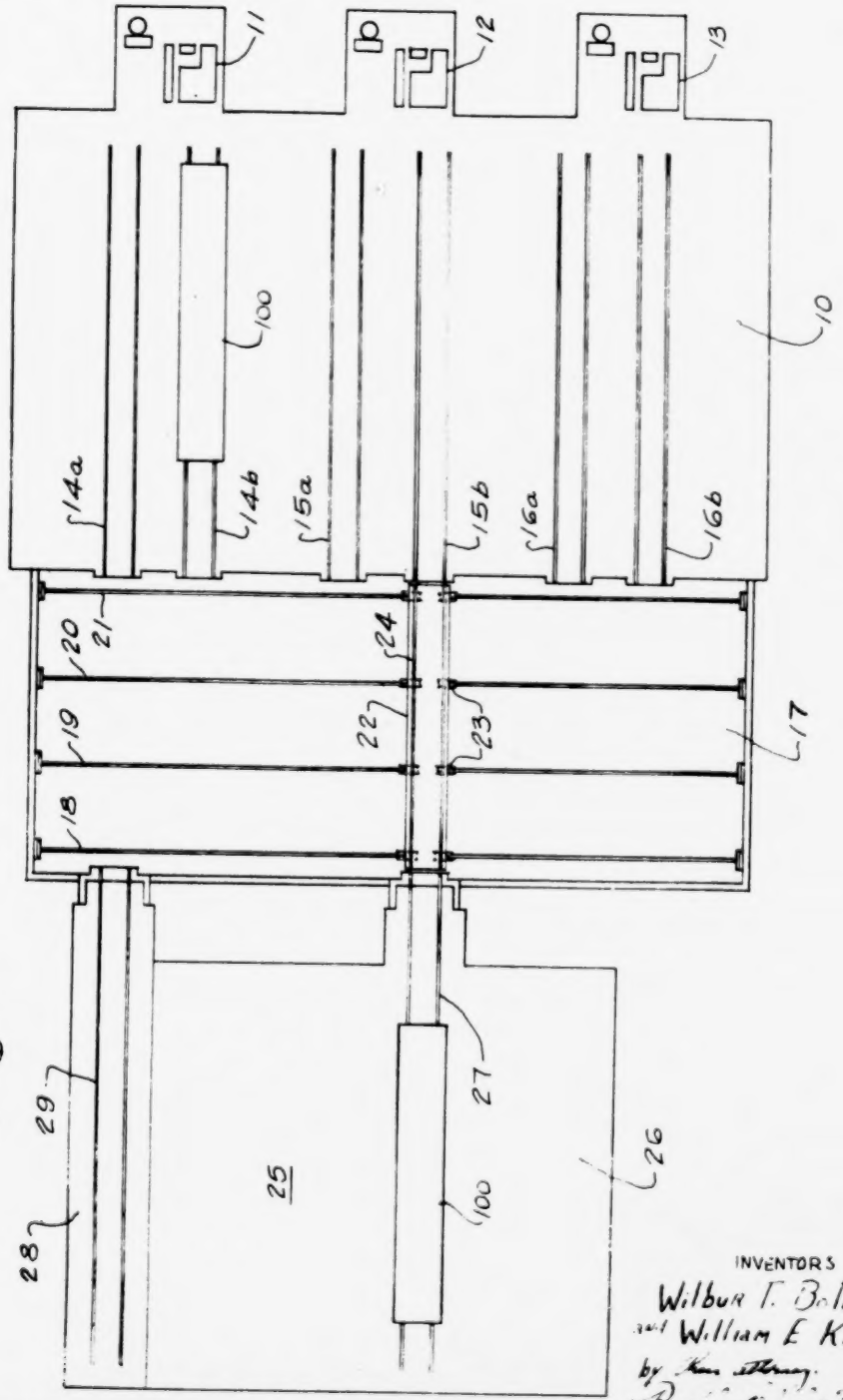


Fig. 1.

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by [illegible]

SILICON CARBIDE FURNACES AND PLANTS

Original Filed Feb. 23, 1967 4 Sheets-Sheet 2

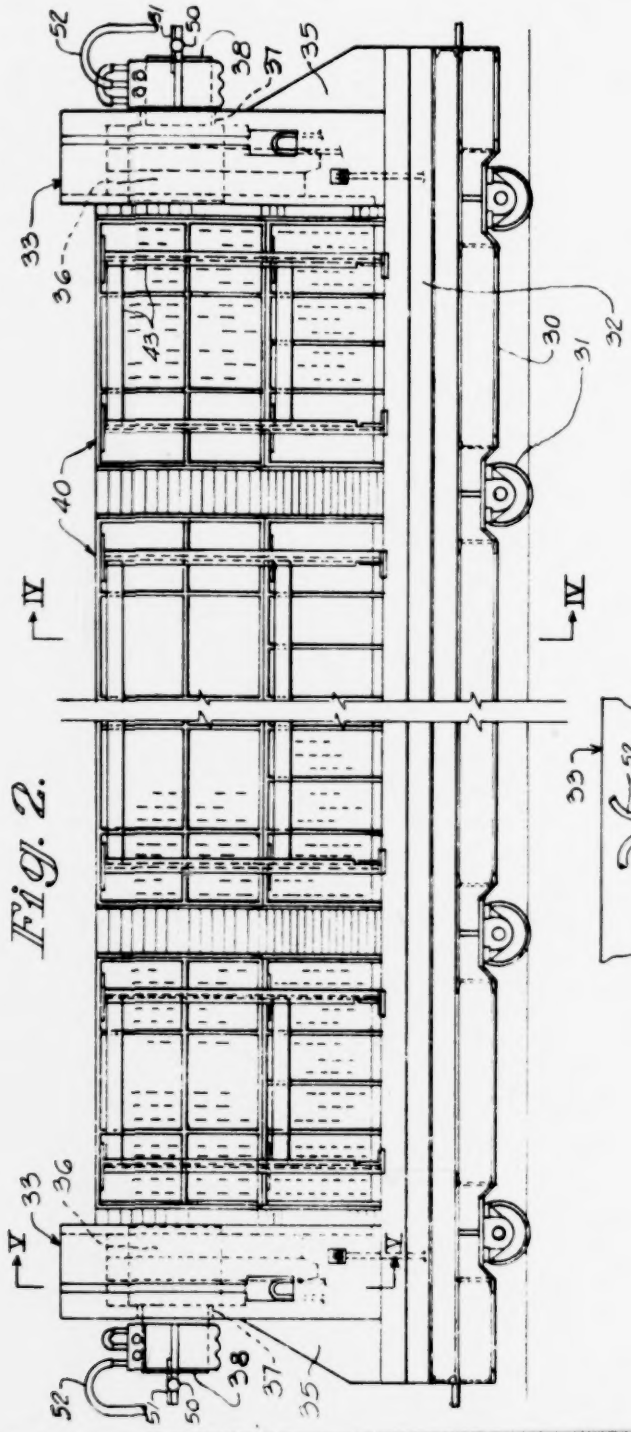


Fig. 2.

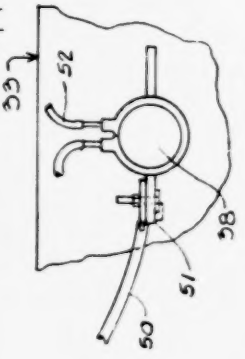


Fig. 6.

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OSE TO EDGE

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LOSE TO EDGE

BLEED THROUGH

SILICON CARBIDE FURNACES AND PLANTS

Original Filed Feb. 23, 1967

4 Sheets-Sheet 3

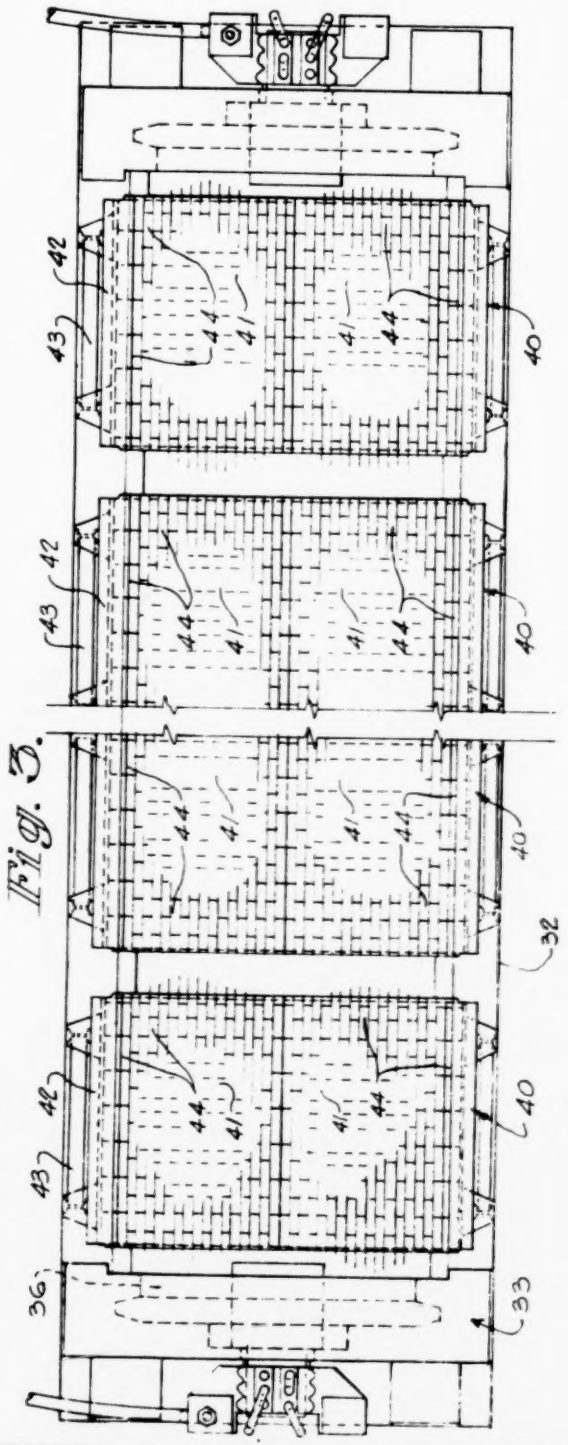


Fig. 3.

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SILICON CARBIDE FURNACES AND PLANTS

Original Filed Feb. 23, 1967

4 Sheets-Sheet 4

Fig. 4.

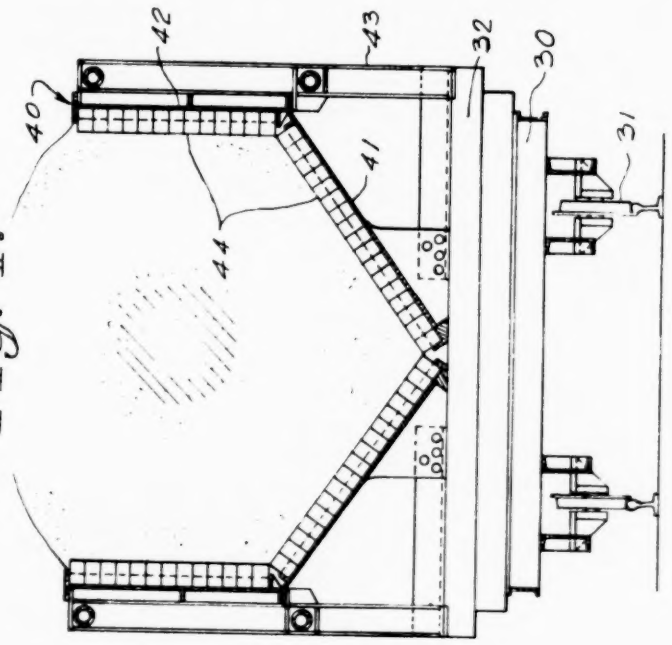
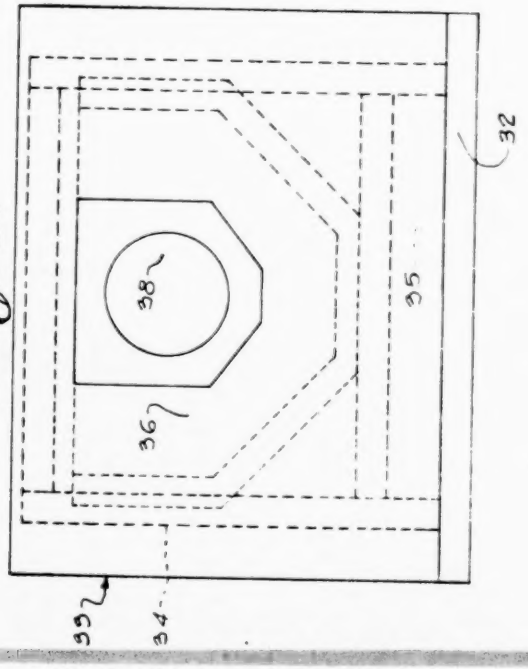



Fig. 5.




PY BOUND CLOSE TO EDGE

BLEED THROUGH

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## UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. Reissue No. 27,018 Dated January 5, 1971

Inventor(s) Wilbur T. Bolkcom et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 23, "nd" should read -- and --. Column 2, line 38, "116a" should read -- 16a --; line 57, "116a" should read -- 16a --. Column 4, line 29, after "claim" insert -- 1 --.

Signed and sealed this 25th day of May 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

27,018

# SILICON CARBIDE FURNACES AND PLANTS

Wilbur T. Bolkcom, Pittsburgh, Pa., and William F. Knapp, Allison Park, Pa., (both % American Metallurgical Products Co., 9800 McKnight Road, Pittsburgh, Pa. 15237)

Original No. 3,432,605, dated Mar. 11, 1969, Ser. No. 618,034, Feb. 23, 1967. Application for reissue Nov. 20, 1969, Ser. No. 878,283

Int. Cl. H05b *3/02, 3/62*

U.S. Cl. 13—20 14 Claims

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.**

## ABSTRACT OF THE DISCLOSURE

A silicon carbide manufacturing plant for manufacturing silicon carbide in a movable furnace at one area, discharging the furnace in a second area and loading in a third area. An electrical power source is provided having a main trackway adjacent the power source with a furnace car movable to and from said power source nd removably connected thereto through electrodes on end panels on the car.

This invention relates to silicon carbide furnaces and plants and particularly to a silicon carbide furnace which can be fired in one position, removed to a second position for cooling and unloading and to a plant incorporating a plurality of such furnaces.

In the past silicon carbide has been manufactured in stationary electric furnaces. Such stationary furnace installations usually require four to six furnaces for each transformer in order to utilize the transformer to its maximum efficiency, with one furnace heating, one being unloaded, one loading, and the remainder cooling. This requires very large capital investment in buildings and furnaces. The unloading of such furnaces is quite difficult and tedious because of the adjacent hot furnaces and because of the necessity of using large amounts of hand labor to remove the silicon carbide from the furnace due to the proximity of the adjacent furnaces and the difficulty of using mechanical unloading equipment in the restricted floor space available. This also requires that the furnaces be cooled in extraordinary long time before unloading in order to get the temperature down to the point where the hand labor can be effectively used. A further problem arises in the loading of such furnaces because of the adjacent other furnaces. This means lengthy conveyor belts from the mixing bins to the furnaces or overhead cranes carrying successive bucket loads to the furnace.

We have invented a silicon carbide furnace and plant which eliminates these problems and makes it possible to produce a given quantity of silicon carbide in a plant area less than ⅓ the size of that required by conventional methods.

Preferably we provide an electrical power source, a main trackway adjacent said power source, a furnace bottom mounted on wheels on said trackway movable to and away from said power source; said furnace bottom having a substantially flat heat resistant surface, removable sides along each side of said surface and removable ends on said surface, said sides and ends defining a heating chamber, electrode means in each of said ends, removable connections between said electrode ends and said power source, a transfer car movable transversely to the main trackway and having a corresponding trackway adapted



to be aligned with the main trackway to receive the furnace bottom wheels and furnace whereby said furnace may be moved transversely to said main trackway, a service area spaced from said main trackway by said transfer car, secondary trackways in said service area receiving said furnace from said transfer car, loading means at said service area adapted to load said furnace and a cooling and unloading section in said service area spaced from the loading means. Preferably the loading means is a gravity discharge hopper or the like located over a trackway adapted to receive a furnace to be loaded from the transfer car. Other loading device and conveying equipment, may of course, be used. The removable ends of said furnace are preferably provided with cooling means removably connected to a source of coolant adjacent the power source whereby the electrodes in the ends can be cooled.

In a preferred embodiment, the sides are a plurality of side-by-side cast iron panels lined with refractory and removed and replaced by crane, loader or similar lifting device.

In the foregoing general description of our invention we have set out certain objects, purposes and advantages of our invention. Other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which:

FIG. 1 is a plan view of a silicon carbide plant floor according to our invention;

FIG. 2 is a side elevation of a silicon carbide furnace according to our invention;

FIG. 3 is a top plan view of the furnace of FIG. 2;

FIG. 4 is a section on the line IV—IV of FIG. 2;

FIG. 5 is a section on the line V—V of FIG. 2; and

FIG. 6 is an enlarged fragment elevation of the furnace end and clamping device.

Referring to the drawings we have illustrated in FIG. 1 a furnace building floor **10** having three transformer units **11**, **12**, and **13**. Adjacent each transformer unit is a pair of trackways **14a–14b**, **15a–15b**, and **116a–16b** each made up of spaced rails. A transfer pit **17** is provided at the end of the trackways remote from transformer units and extending transverse to the length of the trackways. Rails **18**, **19**, **20** and **21** are provided in the pit to carry a transfer car **22** mounted on wheels **23** riding on rails **18**, **19**, **20** and **21**. A trackway **24** is mounted on the transfer car **22** level with the plane of trackways **14a–14b**, **15a–15b**, and **16a–16b** and adapted to be selectively aligned with any one of said trackways by movement of the transfer car. The transfer car is driven by any of various well-known drive means from end to end of pit **17** to align trackway **24** with the furnace floor trackways. A service area **25** is provided adjacent pit **17** on the side opposite furnace floor **10**. The service area is provided with a stripping floor **26** having a trackway **27** on the same plane as trackways **14a–14b**, **15a–15b**, and **16a–16b**. A loading floor **28** is also provided in service area **25** and it too is provided with a trackway **29** on the same plane as trackways **14a–14b**, **15a–15b**, and **116a–16b**. Both trackways **27** and **29** terminate at pit **17** so that trackway **24** on transfer car **22** may be aligned with them. An overhead loading hopper (not shown) is provided adjacent trackway **29** to discharge by gravity over trackway **29**.

A furnace car **100** having a furnace bottom **30** mounted on wheels **31** is adapted to move on wheels **31** on the several trackways **14a–14b**, **15a–15b**, **16a–16b**, **24**, **27** and **29**. A heat resistant surface **32** is provided on the bottom **30**. This surface may be of cast concrete, brick or any of various well-known refractory materials. Identical end panels **33** are removably mounted on each end of the bottom **30**. These end panels are made up of a steel frame **34** carrying a cast concrete end member **35** having a

refractory face **36** of high temperature brick or like refractory material and provided with an opening **37** receiving an electrode **38**.

A plurality of removable side panels **40** extend along each side of the bottom between the two end panels **33** to form a trough-like receptacle. The side panels **40** are made up of an inclined bottom plate **41** and vertical side plate **42** of cast iron or like material carried by a supporting frame **43**. The bottom plate **41** and side plate **42** are lined with refractory brick **44**. The two bottom plates **41** from opposite sides meet generally at the center line of bottom surface **32** to form a generally U-shaped bottom on the receptacle. The electrodes **38** are connected to transformers **11**, **12** or **13** by means of cables **50** and busbars **50a**, each busbar serving a pair of furnaces, and removable electrode clamps **51**. The clamps **51** are preferably water cooled by water introduced into passages in the clamps by water line **52**.

The operation of the plant and furnace of our invention is as follows. The end panels **33** with electrodes **38** mounted in openings **37** are placed on bottom surface **32**. The side panels **40** are then placed on bottom surface **32** to complete the furnace. The end panels and side panels may be placed in position by a high-lift, overhead crane, traveling floor crane or like device. This work is done on the trackway **27** on the stripping floor. The furnace car is then moved from trackway **27** onto trackway **24** on transfer car **22** by means of a high-lift, a winch and cable or any of well known means. The transfer car **22** is then moved to trackway **29** where the furnace car is moved onto trackway **29** and loaded by gravity. The furnace charge is a conventional charge for the Acheson process, i.e., silica and carbon around a carbon electrode core. In the meantime a furnace car ready for stripping may be moved into the stripping area as described hereafter. The furnace car is loaded from the hopper previously described or by some other conventional means and is then returned to the transfer car which is moved to one of trackways **14a–14b**, **15a–15b**, or **16a–16b**. The loaded car is moved onto one of the furnace floor trackways to a position adjacent one of the transformers **11**, **12** and **13**. Clamps **51** are applied to electrodes **38** which are in contact with carbon electrode cores **60** of the furnace charge. The electrical current is applied from the transformer along with water coolant for the clamp. When the charge has been heated to the required temperature and time for conventional Acheson process silicon carbide, the electrical current is stopped and the clamps are removed from electrodes **38**. The clamps are then moved to a furnace car on the next adjacent track of a pair of example **14a–14b**. This adjacent car is then heated while the just completed car cools. Prior to completion of the heating process on the second adjacent car, the first car is removed from the furnace floor trackway onto transfer car **22** and from there to trackway **27** on the stripping floor and a newly loaded car position in its place ready to receive the clamps **51** on completion of the second car.

When the furnace car is moved onto trackway **27**, the side panels **40** are lifted off the bottom surface and the contents of the car pushed off bottom surface **32** onto the stripping floor **26** by means of a high-lift or like device and moved to a storage or loading area. The side panels **40** are replaced and the car is ready to repeat the cycle.

The advantage in time saved and labor saved as well as capital investment in buildings and fixed furnaces by our invention will be obvious to persons familiar with conventional silicon carbide plants. Hand labor is substantially eliminated in the plant of our invention whereas it makes up a very large part of the conventional practices. Much time is saved because unloading can be done at much higher temperatures by the simple expedient of pushing the completed charge off the flat bottom car surface rather than digging it piece by piece from the fixed furnaces of the prior art and loading it in the restricted areas between such furnaces..

While we have illustrated and described certain preferred embodiments and practices of our invention it will be understood that this invention may be otherwise embodied within the scope of the following claims.

We claim:

**1**. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway adjacent said power source, a furnace car movable on said trackway to and from said power source, a refractory bottom on said car, removable side and end panels on said refractory bottom of said furnace car, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and electrode means, a transfer car movable on a trackway extending transversely to the main trackway, said transfer car carrying a trackway corresponding to said main trackway and alignable with the main trackway receiving the furnace car therefrom, a service area opposite the main trackway and spaced from said main trackway by said transfer car, a secondary trackway on said service area receiving said furnace car from said transfer car trackways, loading means in the service area for loading said heating chamber while on said secondary trackway and an unloading section in said service area spaced from the loading means and receiving a completed furnace charge from said furnace car.

**2**. A silicon carbide manufacturing plant as claimed in claim wherein cooling means are provided on each electrode.

**3**. A silicon carbide manufacturing plant as claimed in claim **1** wherein the loading means includes an overhead receptacle above a portion of said secondary trackway.

**4**. A silicon carbide manufacturing plant as claimed in claim **1** wherein a pair of trackways are provided adjacent each power source, each trackway receiving a furnace car.

**5**. A silicon carbide manufacturing plant as claimed in claim **1** wherein said transfer car is movable on tracks in a pit transverse to the main trackway.

**6**. A silicon carbide manufacturing plant as claimed in claim **1** wherein the side panels include an inclined lower portion terminating adjacent the center line of the car.

**7**. A silicon carbide manufacturing plant as claimed in claim **1** having clamp means removable engaging said electrode means in each end panel, connections between said clamp means and said source of electrical power, cooling means on said clamp means, a source of coolant, and connections from said source of coolant to said cooling means.

**8**. A silicon carbide manufacturing plant as claimed in claim **7** wherein the cooling means are coolant passages within the clamp means.

**9**. In a silicon carbide manufacturing plant having an electrical power source, and a main trackway adjacent said power source, the improvement comprising a furnace car adapted to move on said trackway to and from said power source, a refractory bottom on said car, removable side and end panels on said refractory bottom of said furnace car, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and electrode means, a transverse trackway intersecting said main trackway at a level below the main trackway and carrying a movable transfer car having a trackway alignable with the main trackway, a service area spaced from said main trackway by a transfer car, a secondary trackway in said service area receiving said furnace car from said transfer car loading means in the service area adapted to load said heating chamber while on said secondary trackway and an unloading section in said service area spaced from the loading means and receiving a completed furnace charge from said furnace car.

**10**. In a silicon carbide manufacturing plant as claimed in claim **9** wherein the electrode connections are provided with cooling means.

*11. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway area adjacent said electrical power source, a plurality of spaced apart first trackways on said main trackway area, a furnace car movable on each said track to and from said power source, a refractory bottom on each such car, removable side panels on said refractory bottom of said furnace car, end panels on said refractory bottom, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and the electrode means, a service area spaced from said main trackway area, second trackway on said service area on which said furnace cars are movable, transfer means between the first trackway and the second trackway selectively delivering a furnace car from one to the other, loading means in the service area for loading said heating chamber while on said second trackway and an unloading section in said service area spaced from the loading means and receiving a completed furnace charge from said furnace car.*

*12. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway area adjacent the electrical power source, a plurality of spaced apart first trackways on the main trackway area, a plurality of furnace cars selectively movable on each said track to and from the power source, a refractory bottom on each said car, removable side panels on the refractory bottom of each furnace car, end panels on said refractory bottom, the side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between the power source and the electrode means, a service area spaced from the main trackway area, second trackway on the service area on which the furnace cars are movable, a transfer area intermediate the service area and the main trackway area and trackway means in the transfer area for selectively connecting a track of the main trackway with a track of the service area whereby a furnace car may be selectively routed for movement between any trackway on the main trackway area and the trackway on the service area.*

*13. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway area adjacent said electrical power source, a plurality of spaced apart trackways on said main trackway area, a furnace car movable on each said trackway to and from said power source, a refractory bottom on each such car, removable side panels on said refractory bottom of said furnace car, end panels on said refractory bottom, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and the electrode means, a service area spaced from said main trackway*



*area, trackway means on said service area on which said furnace cars are movable, transfer means between the main trackway area and the service area selectively delivering a furnace car from a trackway on one to a trackway on the other, loading means in the service area for loading said heating chamber while on a trackway on said service area and an unloading section in the service area spaced from the loading means and receiving a completed furnace charge from said furnace car.*

*14. A silicon carbide manufacturing plant comprising an electrical power source, a main trackway area adjacent said electrical power source, a plurality of spaced apart trackways on said main trackway area, a furnace car movable on each said trackway to and from said power source, a refractory bottom on each such car, removable side panels on said refractory bottom of said furnace car, end panels on said refractory bottom, said side and end panels being interconnected to form a heating chamber on said car, electrode means in each end panel, removable connections between said power source and the electrode means, a service area spaced from said main trackway area, trackway means on said service area on which said furnace cars are movable, translatory track means between the main trackway area and the service area selectively conveying a furnace car from a trackway on one to a trackway on the other, loading means in the service area for loading said heating chamber while on a trackway or said service area and an unloading section in the service area spaced from the loading means and receiving a completed furnace charge from said furnace car.*


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U.S. Cl. X.R.

13—33